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REPORT OF PROCEEDINGS *of the*
FIFTH ANNUAL CONVENTION
OF THE
WESTERN CANADA
IRRIGATION ASSOCIATION

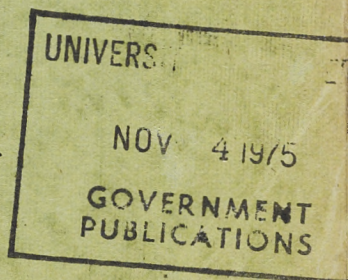
HELD AT

CALGARY, ALTA.
August 8, 9 and 10, 1911

Published by authority of Hon. Frank Oliver, Minister of the Interior

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OTTAWA
GOVERNMENT PRINTING BUREAU
1911



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Alberta Railway & Irrigation Co's project:—Screen and Spillway at Intake.

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WESTERN CANADA IRRIGATION CONVENTION GREAT SUCCESS.

The fifth annual convention of the Western Canada Irrigation Association, held in Calgary on August 9th, 10th and 11th, was a great success. Seventy-three delegates from British Columbia, Saskatchewan and Alberta attended convention, and while numerically this attendance was not so great as last year, the results accomplished, and the resolutions passed, were probably the most important in the history of the association.

Among the features of the convention were lectures by Professor B. A. Etcheverry, of Berkeley, California, who delivered an interesting address on "Pumping for Irrigation"; a paper by Professor W. J. Elliott, Superintendent of Agriculture, Irrigation Department C.P.R., on "The True Significance of Irrigation"; a paper by W. H. Fairfield, Superintendent Dominion Experimental Farm, Lethbridge, Alberta, on "Local Farm Products and Irrigation"; an address by Mr. E. C. Thrupp, A.M. Inst. C.E., Kamloops, B.C., on "The Relative Advantages of Continual and Intermittent Irrigation"; an illustrated lecture by Mr. A. S. Dawson, Chief Engineer, Irrigation Department, C.P.R., on "The Irrigation Project of the C.P.R."; and a paper by R. E. Stockton, Superintendent Maintenance and Operation, C.P.R., on "The Operation of Irrigation Systems." An exhibition of the C.P.I.C. moving pictures "Home-making in Alberta," together with a short talk illustrated with lantern slides, was given the evening of the first day's session by Norman S. Rankin, the Local Secretary of the Association. Other speakers were: James White, Secretary Canadian Conservation Commission, Ottawa; R. H. Campbell, Director of Forestry, Department of Interior, Ottawa; W. R. Ross, Minister of Lands, Victoria, B.C.; A. V. White, Canadian Conservation Commission, Ottawa; F. J. Fulton, K.C., Ex-Minister of Works, B.C., Kamloops, B.C.; J. T. Hall, Permanent Secretary of Western Canada Irrigation Association; Maxwell Smith, Editor "The Fruit Magazine," Vancouver, B.C.; R. N. Agur, of Summerland, B.C.; C. W. Peterson, Superintendent of Irrigation, C.P.R.; J. S. Dennis, Manager, Irrigation and Land Departments, C.P.R.; F. H. Peters, Commissioner Irrigation, etc.

His Honor Lieutenant-Governor Bulyea opened the meeting, and was followed by Mr. C. W. Peterson, retiring president, who in turn gave way to Mr. R. H. Campbell, elected chairman of the session.

During the convention a luncheon was tendered the delegates by the Calgary Board of Trade and City Council, at which Acting Mayor Broeklebank presided, assisted by W. D. Spence, city clerk, and Andrew Millar, Publicity Commissioner.

An excursion to Bassano was one of the most interesting features of the convention. The party, after partaking of a hearty luncheon tendered by the Bassano Board of Trade and City Council, proceeded in carriages to visit the huge dam now under construction at Horseshoe Bend. On the return journey a stop was made at Strathmore, where the delegates and visitors were treated to a feast of strawberries and cream, the product of the C.P.R. Demonstration Farm, in order that the delegates might be convinced of the size and excellence of Alberta berries.

Officers for the ensuing year were elected as follows:—Hon. President, Hon. Mr. Patterson, Lieutenant-Governor, B.C.; President, Hon. W. R. Ross, Minister of Lands, B.C.; First Vice-President, J. S. Dennis, Manager Irrigation, Alberta and B.C. Lands Departments; Second Vice-President, R. H. Agur, Summerland, B.C.; Treasurer, P. Dumoulin, Bank of Montreal, Kelowna, B.C.; Secretary, Norman S. Rankin, C.P.I.C. Co., Calgary; Executive, F. J. Fulton, K.C., Kamloops, B.C.; William Pearce, Calgary, Alta.; E. M. Carruthers, Kelowna, B.C.; W. H. Fairfield, Lethbridge; C. W. Peterson, Superintendent of Irrigation, Calgary; Professor Elliott, Superintendent of Agriculture, C.P.R., Strathmore; W. C. Ricardo, Vernon, B.C.; and R. M. Palmer, Kamloops, B.C.

Kelowna, B.C., was chosen as the next place of meeting.

In preparation for the Fifth Annual Convention of the Western Canada Irrigation Association, the Local Committee at Calgary had the following programme printed.

It was distributed at the different hotels, in order that delegates, immediately on arrival, might know the place of meeting, and advise themselves beforehand, of the Resolutions to be brought forward, and the names of the Speakers who were going to address the Convention. •

INTERIM PROGRAMME

Fifth Western Canada Irrigation Convention

Board of Trade Hall, 231 Eighth Ave. W.

“Intelligent men no longer pray for rain—they pay for it.”

Calgary, Alberta, Canada

August 8th, 9th and 10th, 1911.

THE WESTERN CANADA IRRIGATION ASSOCIATION.

OFFICERS FOR THE YEAR 1910-11.

Honorary President—HIS HONOR LIEUT.-GOV. BULYEA of Alberta.

President—C. W. PETERSON, Calgary, Alta.

First Vice-President—HON. F. J. FULTON, Kamloops, B.C.

Treasurer—C. W. ROWLEY, Calgary, Alta.

Permanent Secretary—JOHN T. HALL, Brandon, Man.

Local Secretary—NORMAN S. RANKIN, Calgary, Alta.

EXECUTIVE

W. H. FAIRFIELD, Lethbridge, Alta.

HORACE GREELEY, Maple Creek, Sask.

DR. CHARLES W. DICKSON, Kelowna, B.C.

R. H. AGUR, Summerland, B.C.

R. H. PALMER, Kamloops, B.C.

NOTES.

The Board of Trade Hall will be the headquarters of the Convention during its session.

Delegates will kindly register on arrival in the book kept for the purpose in the anteroom of the Convention Hall, and leave their standard certificate with the Secretary.

The Local Secretary is in touch with a number of boarding houses, and members who do not wish to stay in a hotel or who cannot find accommodation, will be directed where to find rooms.

IMPORTANT.

A badge will be issued to each delegate and must be worn during the Sessions of the Convention in order that the Chairman may distinguish properly accredited delegates from ordinary spectators.

INTERIM PROGRAMME

August Eighth.

The Convention will assemble in the Board of Trade Hall, Board of Trade Building, 231 Eighth Ave., W., at 11.30 a.m. August 8th.

The Chairman will call the meeting to order and an address of welcome delivered by His Worship, the Mayor. The Conference will then be declared officially opened, and after various addresses of welcome, the Convention will proceed to the election of committees on resolutions and credentials. Adjournment for lunch at 12.30.

At 2.30 the meeting will reassemble and sit during the afternoon.

At 7.30 through the courtesy of members of the Calgary Automobile Club, cars will be in waiting at the Board of Trade Building to carry delegates on a sight-seeing tour of city and suburbs.

At 9.00 o'clock, an exhibition of the C.P.I.C. Co's "Home Making in Alberta" film will be given. The scenes depicted in this film were taken in the vicinity of Calgary and the Irrigation Block, and show in an interesting manner all the vicissitudes of settler life on the prairie from the moment he deserts the box car which brings him, his family and belongings across the border until 5 years later, independent and happy he is seen occupying a comfortable farm home surrounded by his children and growing possessions. The film is now being used in the United States, Great Britain and the Continent in order to show prospective settlers just what they may expect in Western Canada.

August Ninth.

The Convention will open at 9.30 o'clock, and the morning devoted to business. An adjournment will be made at 12.00 noon, in order that delegates may take part in the luncheon tendered to them at 12.30 in Paget's Hall by the Board of Trade and City Council.

At 2.15 business will be resumed. Prof. B. A. Etcheverry, of Berkeley, California, will read a paper on "Pumping for Irrigation."

At 8.30, Mr. A. S. Dawson, Chief Engineer, Irrigation Department, C.P.R., will read a paper "The Irrigation Project of the C.P.R." illustrating same with over a hundred slides made from photographs recently taken.

At the conclusion of Mr. Dawson's lecture, Professor Etcheverry will give a short talk on "Irrigation in the Western States," illustrating it with lantern slides.

August Tenth.

A special train provided for the occasion will leave Calgary at 10.30 a.m. for Bassano to convey the delegates to inspect the Irrigation Dam now under construction 3 miles south of the town, which will irrigate some 570,000 acres in the Eastern Section of the Irrigation Block.

Arriving at Bassano, the delegates will be the guests of the local Board of Trade and Town Council at luncheon, after which conveyances will be provided to conduct them to inspect the dam.

The return journey will be arranged so as to endeavor to allow of a short stop at Strathmore to inspect the C. P. R. Demonstration Farm, the party arriving in Calgary again at 6.00 o'clock.

IMPORTANT.

The trip to Bassano and return will occupy four to five hours of actual travel. If therefore, weather conditions at Bassano are unfavorable on the morning of the excursion, the same will be cancelled and the convention will meet at 11 a.m. in the Board of Trade Hall.

Addresses of Welcome.

His Honor, Lieutenant-Governor Bulyea.

His Worship, Acting Mayor Brocklebank.

Speakers.

E. C. Thrupp, A.M. Inst. C.E., Kamloops, B.C.—*The Relative Advantages of Continual and Intermittent Irrigation.*

Professor W. J. Elliott, Supt. of Agriculture, Irrigation Department C.P.R.—*The True Significance of Irrigation.*

W. H. Fairfield, Supt. Dominion Experimental Farm, Lethbridge, Alta.—*Local Farm Products and Irrigation.*

A. S. Dawson, Chief Engineer, Irrigation Department, C.P.R.—*The Irrigation Project of the C.P.R.*

Professor B. A. Etcheverry, Berkeley, Cal.—*An Address on "Pumping for Irrigation."*

R. E. Stockton, Superintendent Maintenance and Operation, C.P.R.—*The Operation of Irrigation Systems.*

James White, Secretary Canadian Conservation Commission, Ottawa, Ont.

R. H. Campbell, Director of Forestry, Department of the Interior, Ottawa, Ont.

E. F. Drake, Forestry and Irrigation Branch, Department of the Interior, Ottawa, Ont.

A. E. Meighan, Fruitlands, B.C.

W. S. Ross, Minister of Lands, Victoria, B.C.

A. V. White, of Canadian Conservation Commission, Ottawa, Ont.

Hon. F. J. Fulton, K.C., Ex Minister of Works B.C., Kamloops, B.C.

N. E. Webster, New York, N.Y.

RESOLUTIONS.

RESOLUTION. INTERIM No. 1.

Moved by

Seconded by

Whereas, the experience of the previous conventions of this Association has shown that the problems and questions in connection with irrigation in the Province of British Columbia are widely different from those in the Provinces of Alberta and Saskatchewan, and has also shown that the number of delegates from British Columbia attending the meetings when held in Alberta or Saskatchewan is very small and is also the number of delegates from Alberta and Saskatchewan when the meetings are held in British Columbia.

Therefore be it resolved that, in the opinion of this Convention, it is advisable to form separate Associations in the Province of British Columbia, and in the Provinces of Alberta and Saskatchewan which, while remaining affiliated with each other, will hold their conventions separately.

RESOLUTION. INTERIM No. 2.

Moved by

Seconded by

Whereas, the conservation of the forests on the east slope of the Rocky Mountains, so as to promote the gradual melting of the snow and equalization of the run-off of storm waters, is one of the most important factors in the successful irrigation development of Southern Alberta; and

Whereas, an Order-in-Council has recently been passed greatly restricting the area of the Rocky Mountain Park and thus withdrawing from the area now excluded the close fire guarding and general conservation which has, in the past, been devoted to the said Park;

Therefore, be it resolved, that the Honorable Minister of the Interior be requested either to extend the boundaries of the Rocky Mountain Park to cover the original area set apart or to greatly augment the fire guardian service now in successful operation in the Forest Reserves in the Rocky Mountains, in order to adequately cover the area now excluded from the jurisdiction of the Parks administration.

RESOLUTION. INTERIM No. 3.

Moved by

Seconded by

Whereas, a knowledge of the practical duty of water for various crops has a most important bearing on irrigation development; and

Whereas, information upon this important question, available in any of the Provinces of Alberta, Saskatchewan and British Columbia, is vague and incomplete;

Therefore, be it resolved, that the attention of the Governments interested should be directed to this important matter and that they should be urged to carry out a thorough system of investigation to determine the duty of water in the different provinces and for the different crops, so that such duty may then be determined by approximate exactness.

RESOLUTION. INTERIM No. 4.

Moved by

Seconded by

Whereas, an accurate knowledge of the location and quantity of water supply available, is the basis of irrigation development; and

Whereas, the matter of topographical and hydrographical surveys to determine the location and quantity of such water supply and the proper methods of conserving it must be undertaken by the Government administering the law relating to the use of such water;

Therefore, be it resolved, that this Convention urges strongly upon the Dominion Government the importance of making the necessary appropriations and providing the necessary staff to continue in an intelligent and systematic manner the work of gauging all streams of water supply and location of all sites suitable for reservoirs for the storage of water, initiated a number of years ago.

RESOLUTION. INTERIM No. 5.

Moved by

Seconded by

Whereas, a Provincial University has now been established in Alberta; and

Whereas, ex-Premier Rutherford made the announcement, prior to his retirement, that a Provincial Agricultural College would be established in connection therewith; and

Whereas, the present Government of the Province of Alberta has made no announcement in regard to the location of the proposed Agricultural College; and

Whereas, the far reaching importance of agriculture under irrigation demands imperatively that proper attention be paid to this subject in the curriculum of any Agricultural College established in the Province of Alberta; and

Whereas, such would be impossible unless the College Farm was so located as to facilitate demonstration work under irrigation, thus giving students an opportunity to study the practical side of the artificial application of water; and

Whereas, under the climatic conditions of the Province of Alberta, agricultural demonstration work without the aid of irrigation may be successfully prosecuted in almost any portion of the Province, thus making the location of the Agricultural College an immaterial one as regards the interests of non-irrigated lands; and

Whereas, the gravest objections also exist to the policy of associating too closely colleges solely devoted to agricultural education and universities devoted to general educational work.

Therefore, be it resolved, that this Convention emphatically places itself on record in favor of the policy of having the Provincial Agricultural College of Alberta disassociated entirely from the Provincial University and situated in a district where irrigation by gravity may be practised.

RESOLUTION. INTERIM No. 6.

Moved by

Seconded by

Whereas, the conservation of water for irrigation purposes by companies and individuals as at present carried out does not admit of the whole available area in each district being brought under cultivation; and

Whereas, the conservation of water by the government would be the means of developing such areas to the fullest extent, assure absolute permanency of supply and materially increase the security to bond holders.

Be it resolved that the Governments in which such districts exist be urgently requested to give the matter their serious consideration and to put such system into operation at the earliest possible date.

THE WESTERN CANADA IRRIGATION ASSOCIATION.

OFFICERS FOR THE YEAR 1911-12.

Hon. President—HON. T. W. PATTERSON, Lieutenant Governor, B.C.

President—HON. W. R. ROSS, Minister of Lands, B.C.

First Vice-President—J. S. DENNIS, Mgr. Irrigation, Alberta and B.C. Land Depts., C.P.R., Calgary.

Second Vice-President—R. H. AGUR, Balcona Ranch, Summerland, B.C.

EXECUTIVE.

F. J. FULTON, K.C., Kamloops, B.C.

W. PEARCE, Calgary, Alta.

E. M. CARRUTHERS, Kelowna, B.C.

W. H. FAIRFIELD, Lethbridge, Alta.

C. W. PETERSON, Calgary, Alta.

W. J. ELLIOTT, Strathmore, Alta.

W. G. RICARDO, Vernon, B.C.

R. M. PALMER, Kamloops, B.C.

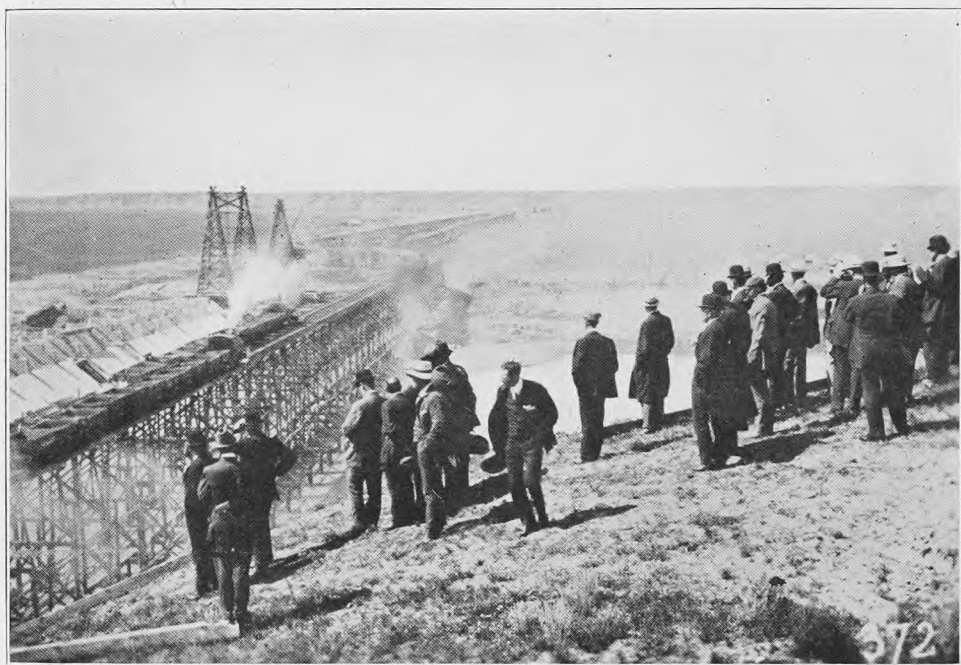
Permanent Secretary:—NORMAN S. RANKIN, Calgary, Alta.

Treasurer:—P. DUMOULIN, Mgr. Bank of Montreal, Kelowna, B.C.

NEXT PLACE OF MEETING:—KELOWNA, B.C.



Members of the Western Canada Irrigation Association. 5th Annual Convention, 1911.
Inspecting C. P. R. Irrigation works at Bassano.



Delegates to the Western Canada Irrigation Association's Convention inspecting 7,000 foot earth
dam at Bassano to irrigate 440,000 acres of land in the Eastern
section of the C.P.R. irrigation block.

REPORT OF THE PROCEEDINGS
OF THE
FIFTH ANNUAL CONVENTION
OF THE
WESTERN CANADA IRRIGATION ASSOCIATION
HELD AT CALGARY, ALBERTA
ON
AUGUST 8TH, 9TH AND 10TH, 1911.

OPENING SESSION—TUESDAY MORNING.

The fifth annual convention of the Western Canada Irrigation Association opened in Calgary on Tuesday, August 8, 1911, at 11.30 a.m.

The chair was taken by Mr. C. W. Peterson who immediately declared the convention open for business.

LIEUTENANT-GOVERNOR BULYEA.

'I am very pleased indeed to be here to-day and to take part in the discussions of this convention. We realize, those of us who have been out this morning, possibly, that irrigation is not particularly necessary just now, but those of us who have been in this country a long time and have followed the work of the different Irrigation Conventions know very well that the work they are doing is necessary in the interests of the country and in the interests of those who are trying to develop the resources of the country. I am sure that you have a great work to do, a work that is of immense benefit, and those who have been privileged to attend your conventions heretofore and who have listened to the discussions of the different people who have taken an interest in them, and who make this irrigation work a specialty, must all realize the immense benefit that your annual conventions do to the country. I am very pleased indeed to see so many here. I welcome you to this Province, those who have come from the outside, and am glad that you will have the co-operation of everyone in the city and in the vicinity in your deliberations.

'I therefore declare this convention duly and formally open.'

ACTING MAYOR R. A. BROCKLEBANK.

'Your Honor, and gentlemen of the Association: It affords me considerable pleasure this morning to welcome you to our city on behalf of the citizens of Calgary. I do not know whether I have got the right interpretation of irrigation or not,

but as I understand irrigation it is to make an arid place productive, and it is for the purpose of moistening the dry places. Now, it seems to me that neither of these qualifications is necessary on this occasion—this morning—it seems that the atmosphere is quite moist enough, and that fields in the vicinity of Calgary are quite productive enough so far as growth is concerned. However, on behalf of the citizens it affords me much pleasure in welcoming the delegates to this fifth annual convention of the Western Canada Irrigation Association for the city of Calgary. I am not going to detain you for any length of time, you have quite an extensive programme mapped out for your deliberations, and by the time you are through with your convention, the electing of officers and the discussion of the various papers which will be presented to you for consideration here, I am sure you will be much benefitted by the deliberations of the fifth annual convention of the Western Canada Irrigation Association. I again extend to you a hearty welcome from the citizens of the city of Calgary; I hope that your stay among us will be a pleasant one; and I do not know that I can add anything further to this, Mr. President. You all know that Westerners are noted for their hospitality, and I have much pleasure in extending to you the freedom of the city.'

MR. CORDY (Summerland, B.C.)

'Gentlemen,—Speaking as one of the delegates from the dry belt in British Columbia, I think I may safely say that we appreciate the kind welcome given to us by the acting Mayor. It always gives us in British Columbia (I know it does me, speaking personally) great pleasure to come up to Alberta, and especially to Calgary. I was here the last time four or five years ago, and certainly the difference in the city is marvellous, it is beyond conception; and as the acting Mayor says we do not wish to take up any time, but there is one thing I should like to point out to you: While you in Alberta produce the finest beef and wheat in the world, we, in British Columbia produce the finest fruit; and we always look forward to a good trade between the two provinces, we with our fruit, and you with your beef and grain; we are paying enough for your hay now—\$30 a ton—down where we are, and I hope you will retaliate on the fruit this season. There is one other point of similarity I notice, though I don't need to mention it particularly—though we are good fellows in B.C., we are supposed to be a little bit slow in starting the meetings, and I notice the same thing applies here. I will close, therefore, on behalf on the delegates from British Columbia in thanking the acting Mayor for his kind welcome and hospitality.'

PRESIDENT'S ADDRESS.

CHAIRMAN: (MR. C. W. PETERSON.)

'In getting down to actual business it may be proper for me to explain that I am here as president of this convention simply and purely through an unfortunate accident: Mr. William Pearce, who was elected president at the last meeting,

left the country for an extended tour around the world, and it was the judgment of the Executive that someone in Calgary should assume the position of president until such time as the convention opened, when the convention itself, of course, would elect its head.

‘I am sorry to say that through the year the executive committee has been depleted through the lamented death of Mr. R. R. Jamieson, ex-mayor of Calgary, who has rendered us active assistance for some years; and in the removal of Mr. C. W. Rowley, another intensely active man in the interests of irrigation, who was sent to Winnipeg by his bank. Under the circumstances, the Calgary side of the executive committee has been reduced to very few members, and we have done the best, the very best, we could in order to make the convention quite as successful as possible. The weather conditions are not, of course, conducive to irrigation thought, but there is always this redeeming feature about it, that an irrigation system is not complete, may not be considered complete in any sense of the word, unless coupled with it is a very efficient drainage system, so, fortunately the farmer on the irrigated land is alright, whether it rains in excess or whether he is visited by drouth. It is just as well to take all the consolation out of the present weather that we can.

‘We are going through the pioneer stage in this province now. Newcomers on irrigated lands are going in, very largely, for grain production. Grain production has never been advocated by any good friend of irrigation in Alberta on irrigated lands; we have always advocated the production of fodder crops, leading to the feeding of live stock, and finally, to the farming itself. I am glad to see that there are signs that alfalfa will be very largely produced in the next few years, and when that comes, seasons like the present will not worry the irrigator any. Early this year he would have had ample use for his water—it has been well illustrated this year—I believe on the C.P.R., Western Irrigation tract. We have had some 200 services so far, principally early in the season, which illustrates the fact that when fodder crops are produced, it will take a very exceptionally wet year to render irrigation useless.

‘We have a very interesting programme before us; in the printed programme you will find a list of the speakers and probable speakers, and a list of the resolutions to be submitted to the convention. There is one of them that I desire to particularly draw your attention to, and that is one of the resolutions sent in by one of the delegates from British Columbia, suggesting a division of this convention, forming one for the province of British Columbia, and another for the prairie provinces or the province of Alberta. This is something that has a very important bearing on our whole system, and is a matter that I think merits close attention and consideration from the delegates.

‘We will have here to-morrow Prof. Etcheverry of Berkeley, California. Unfortunately he can only stay with us one day, and we have him down in our programme for an address to-morrow afternoon. The local committee have laid off a trip to Bassano in order to inspect the large engineering works that are being constructed there by the Canadian Pacific railway, particularly the big dam at Horse Shoe Bend at the Bow river, and if the weather conditions don’t improve very materially within the next two days I am afraid that we will have to call that

trip off; we may possibly make arrangements to run as far as Strathmore and visit the demonstration farm at that point, but the trip to Bassano involves railway travelling amounting to 160 miles, and as rolling stock is very short we have only been able to get one coach; under the circumstances, unless the roads were good, and we could make the trip to the dam and back again fairly quickly, it



Gathering Strawberries, C.P.R. Demonstration Farm, Strathmore, Alta.

would probably be a very tiresome trip, so that unless there is some material change in the weather, the convention will probably desire to shorten the trip and only go as far as Strathmore; it is a matter that will be left in your hands and we will ascertain your wishes a little later on.

'Now, the first business of the convention will be the presentation of the secretary's report, followed by the election of the committee on credentials and the committee on resolutions.'

SECRETARY'S REPORT.

Mr. John T. Hall then submitted his annual report as follows:—

In preparation for the convention official notices were sent out as follows:—

OFFICE OF THE SECRETARY,
LETHBRIDGE, ALTA.

'The Western Canada Irrigation Association hereby extends to you, a cordial invitation to be present at the fifth annual convention, to be held in the city of Calgary, Alta., August 8, 9, and 10, 1911.

'The conventions of this Association have now become a recognized factor in the progressive development of irrigation in Western Canada, and this, the fifth annual convention, promises to be the mark of a still further step along the lines of advancement in the art and science of irrigation.

'Arrangements are being made to have recognized experts in irrigation and allied subjects address the convention, and every opportunity will be given for the interchange of ideas and discussion thereon, that will lead to the very best development.

'A large number of delegates are already promised, and it is hoped that every person interested in practical irrigation will be present.

'The basis of representation at the convention established by the constitution is as follows:—

“The Governor General of Canada, Members of the Dominion Cabinet, the Senate and the House of Commons, the Dominion Commissioner of Irrigation, Director of Forestry, the Director and Superintendents of Dominion Experimental farms, five representatives of the Canadian Society of Engineers, two representatives from each Canadian railway, and one from each agricultural paper in Canada.

“From the provinces of Manitoba, Saskatchewan, Alberta and British Columbia:—

“The Lieutenant Governors, the Members of Legislatures, the Deputy Ministers of Provincial Departments, Provincial Irrigation Commissioners, three each from all Irrigation and Irrigation Colonization Companies, two each from all Agricultural, Forestry and Live Stock Associations, five each for all cities, appointed by the Mayor, two each for Boards of Trade or similar organizations, two each from all town, village or rural municipalities, to be appointed by the Mayor, Reeve or Overseer, two each for all Canadian Clubs, to be appointed by the President, the Superintendent, or representative appointed by him, for each experimental or demonstration farm, three representatives from other irrigation associations to be appointed by their presidents.”

'It is especially requested that anyone having a resolution to bring before the convention for discussion, mail a copy of the same to the executive committee secretary at Lethbridge, by July 30th, so that it may be printed for convenience at the convention.

'And also that intending delegates will notify Norman S. Rankin, Calgary, local secretary, of their intention to be present, in order that the necessary accommodation may be arranged.

'The usual convention rates will be obtained from the C. P. R., the A. R. & I., C. N. R. and also the G. N. R.

'Be particular to observe the following:—A list of your delegates should be sent in as early as possible and urge upon them the necessity of buying single fare tickets, and at the same time procuring a standard certificate from the agent that they are delegates to this convention. If they come over more than one line of railway, get a standard certificate from each railway company when purchasing the single fare ticket.

‘Register and hand in your certificate to the secretary immediately on your arrival in Calgary and see that you get it back from him before leaving, in order to get your reduced fare home.

‘We sincerely trust that you will impress upon your people the great importance of this convention, particularly at the present time when Western Canada is entering upon an era of prosperity greater than she has ever enjoyed before, and with the country settling up so rapidly that towns seem to spring up in the night. It is of vital importance that the representative business men of the west should get together and discuss the problems of the day and the possibilities of the future for the province along the line of irrigation.’

I beg to remain, Sir,

Your obedient servant,

(Signed) JOHN T. HALL, *Secretary*

Western Canada Irrigation Association.

TO THE PRESIDENT AND MEMBERS OF THE WESTERN CANADA IRRIGATION ASSOCIATION:

‘In presenting the fifth annual report of the Secretary of the Association, I beg to report there appears to be a greater desire on the part of the federal and provincial governments to encourage in every possible manner, the spreading of a thorough knowledge of irrigation and the benefits to be derived therefrom, and a growing desire on their part to recognize and grant some slight financial aid to more successfully carry on the work of the association, which in the past has been very much hampered through lack of proper material with which to work, and were it not for the fact that the Department of the Interior very kindly assumes all the responsibility for publishing the yearly proceedings of the Association, as a departmental report, we would not be in a position to carry on the work at all.’

This is the first financial statement that has been presented to your Association, and it would be necessary to go back to the Lethbridge convention of 1909, when Mr. J. W. McNichol, acted as secretary for the local committee and then received an unexpended balance from the Vernon convention of 1908, amounting to \$218.63. This was augmented by a grant of \$300 from the Alberta government. The expenses of that convention were \$421.29, as per statement attached, and we received the unexpended balance of \$97.34 after my appointment as permanent secretary.

The 1910 convention held in Kamloops, received a grant from the British Columbia government direct to their local committee of \$2,000, and the unexpended balance of \$908.30 was forwarded to us on January 6th, so the total amount of funds passing through my hands was \$1,005.64 and the expense for the year before to the present time, was \$190.35, leaving a balance of \$810.29, which lies in the Bank of Commerce in Lethbridge.

'I attach to this report the correspondence with Hon. F. J. Fulton, our First Vice-President, who deserves the credit of securing this money for us. I also attach the correspondence with the provincial government, who have this year very generously given us a grant of \$1,000.00, which at our request was forwarded to our president, Mr. C. W. Peterson, to meet any contingent expenses of the convention at Calgary.

'I cannot close my report without expressing regret at the loss which the Association has sustained in the demise of the late R. R. Jamieson, Second Vice-President, and think some expression of regret should go from this convention to the members of his family. The executive also suffered a loss when Mr. C. W. Rowley, the treasurer of our association, found it necessary to resign his position on account of his removal to the city of Winnipeg.

'Financial statement for the past two years attached to this report. All of which is respectfully submitted.

(Signed) JOHN T. HALL.

Permanent Secretary,

FINANCIAL REPORT OF IRRIGATION CONVENTION HELD AT LETHBRIDGE, AUGUST 5TH AND 6TH, 1909.

RECEIPTS

Check from Vernon convention	218.63
Check from Alberta government	300.00

EXPENSES

2 trips to Calgary to attend meetings	26.75	
Postage, telegrams and sundries.	32.24	
Banners	5.00	
Rent of hall	20.00	
Printing	43.75	
Stenographic report	90.00	
Secretary, J. W. McNichol	200.00	
Photo for report	3.00	
Discount on Vernon check55	
Balance	97.34	
	<hr/>	
	\$ 518.63	\$ 518.63
Dec. 2nd, sent J. T. Hall.	75.00	
Dec. 31st, balance on hand.	22.34	
	<hr/>	
	\$ 97.34	

(Signed) J. W. McNICHOL,

Local Secretary.'

FINANCIAL STATEMENT.

WESTERN CANADA IRRIGATION ASSOCIATION.

RECEIPTS

Dec. 4, 1909, remittance from Lethbridge	75.00
Aug. 22, 1910, remittance from Lethbridge	22.34
Jan. 6, 1911, unexpended grant made by the British Columbia government.	908.30
	<hr/>
	\$1005.64

EXPENDITURES

Stationery	35.75	
Railway fares, etc.	94.60	
Stenographer	19.00	
Postage.	25.00	
Livery and sundries	21.00	195.35
	<hr/>	<hr/>
Balance.		\$ 810.29

CORRESPONDENCE.

Letter to Hon. F. J. Fulton, K.C., Victoria, B.C., written under date of August 17th, 1910.

'DEAR SIR,—

'RE IRRIGATION ASSOCIATION FUNDS.

'At the request of the President of the Western Canada Irrigation Association, Mr. William Pearce, we are writing you regarding the question of funds for carrying on the work of the Association.

'As we intimated to you in a former letter, we have not been successful in procuring financial assistance from any of the governments outside of the province in which the convention is held. We have been carrying on the work during the past year with a small balance left from grant from the provincial government of Alberta to the Lethbridge local committee, last year, and this is now considerably overdrawn.

'We will esteem it a favor if you will consult your local committee, and any sum that may be left from the grant made by your government to your local committee, will be very acceptable to the Association.

'If you will kindly request them to have a check made payable to Mr. Rowley of Calgary, accompanied by a statement of expenditures, and forward a copy of the same to me at their earliest possible convenience, I shall be pleased.

'We are writing Mr. J. T. Robinson by this mail, and asking him to consult you regarding the matter.

'Trusting to hear from you at an early date, I remain,

'Yours sincerely,

(Signed) 'JOHN T. HALL,

'Secretary.'

Letter from Hon. F. J. Fulton, Kamloops, B.C., under date of September 2nd, addressed to John T. Hall, Secretary, Brandon.

'DEAR SIR,—Your of the 17th ultimo respecting any balance of the grant from the provincial government to the recent Irrigation Convention arrived during my absence in Victoria. I do not know as yet what balance will remain. As soon as we ascertain that, we will take up the question with the provincial government, as I am not certain whether they intended the grant solely for the convention or not. If they are willing that it should go to the Association, I am sure our local committee will be only too pleased to see it handed over.

'Yours sincerely,

(Signed) 'F. J. FULTON.'

To Hon. F. J. FULTON, Second Vice President, Kamloops, B.C., from J. T. Hall, Secretary, under date of September 17th, 1910:—

'DEAR SIR,—Your favor of September 2nd received here during my absence in the west, contents of which we fully note.

'We sincerely trust that you will be able to prevail upon the Provincial government in order that they may grant the balance from the appropriation made to the Kamloops convention, otherwise the Association will be considerably behind, as the only funds available for the ordinary work of the Association is what is left over from these conventions.

'Lethbridge last year received a small amount from the Vernon convention, and this year we received the sum of \$97.34 from those having charge of the Lethbridge convention; and the expenses connected with the Association have exceeded this by between two and three hundred dollars, so we sincerely trust that you may be able to assist in wiping out this deficit. We are communicating with Mr. Price Ellison upon the same subject.'

To Hon. F. J. FULTON, K.C., Second Vice President, Kamloops, from Secretary Hall, under date of September 26, 1911.

'DEAR SIR,—We received the enclosed letter from the Honourable Price Ellison, Chief Commissioner of Lands, which speaks for itself.

'If you will kindly bring the matter to the attention of your secretary, Mr. Galloway, and your local committee and forward a cheque to me, payable to Mr. C. W. Rowley, Treasurer of the Association, we will enter same in our books here and forward to him for deposit to the credit of the Association in Calgary.

'Trusting that we are not troubling you too much in regard to this, I remain

'Yours very truly,

'JOHN T. HALL,

'Secretary.'

To HON. F. J. FULTON, Kamloops, from John T. Hall, secretary, under date December 14, 1910.

'DEAR SIR,—

'RE PRESIDENCY OF THE WESTERN CANADA IRRIGATION ASSOCIATION.

'Following the suggestion of Mr. Pearce, we have communicated with Mr. Jamieson and he declines to act, but suggests the name of Mr. Charles W. Peterson. We have communicated with him and he would prefer Mr. Jamieson, should it be the wish of the executive he is willing to act. Hon. F. J. Fulton is the First Vice President of the Association, and Mr. R. R. Jamieson is the Second Vice President. Personally, I think as the next convention is to be held in Calgary, that it would be advisable to elect a Calgary man.

'Some time ago we received a communication from Hon. Price Ellison to the effect that the unexpended balance of the appropriation by his government for the 1910 convention in Kamloops, was the property of the Association and we have just received a letter from Mr. C. W. Rowley, of the Canadian Bank of Commerce, Calgary, who is our treasurer, that up to the present time he has not received this amount from your local committee.

'We will esteem it a great favor if you will kindly urge upon your local committee the necessity of having this balance forwarded to the treasurer of the Association, at the earliest possible date. Kindly let us hear from you at your earliest possible convenience.'

'Yours sincerely,

(Signed) 'JOHN T. HALL,'

'Secretary.'

From HON. F. J. FULTON, Kamloops, to John T. Hall, Secretary, under date of January 3rd, 1911.

'DEAR SIR,—I now have authority from the Hon. W. J. Bowser, Acting Minister of Finance, to hand over the balance of the provincial government grant to you, and I therefore enclose cheque in favor of the Association for \$908.30. Kindly acknowledge receipt.'

To HON. F. J. FULTON, Kamloops, B.C., from John T. Hall, Secretary, under date of January 6, 1911—

'DEAR SIR,—I beg to acknowledge receipt of your favor of the 3rd inst., enclosing cheque for \$908.30, which we have forwarded to Mr. C. W. Rowley, Bank of Commerce, Calgary, who is treasurer of the Association.

'Thanking you for the attention given this matter, and your kindly interest all times in the welfare of the Association, and wishing you the compliments of the season, I beg to remain,

'Yours very sincerely,

(Signed) 'JOHN T. HALL,
'Secretary.'

From C. W. ROWLEY, Treasurer, Calgary, to C. W. Peterson, Calgary, under date of May 10, 1911—copy to J. T. Hall, Secretary:—

'DEAR MR. PETERSON:—Owing to my early removal to Winnipeg I beg to tender my resignation as hon. treasurer of the Western Canada Irrigation Association. I enclose herewith statement of the account with vouchers, and check for the balance in favor of the Association, and would suggest that these be checked over and an acknowledgment of the same forwarded to me.

'If you do not know of anybody at the moment for the position of hon. treasurer, I would suggest Mr. E. M. Saunders, my successor, who is a public spirited man, and I feel would be glad to take the work up. Wishing you and the Association every success in the future, I am.

'Yours sincerely,

(Signed) 'C. W. ROWLEY,'

Copies of letter sent to The Albertan, The Herald, and The News, Calgary, under date of April 6th, 1911, by J. T. Hall, Secretary:—

'We enclose for your perusal, the first circular letter calling the fifth annual convention of the Association, to be held in the city of Calgary where it was organized five years ago.'

'The officers and the executive are doing everything in their power to make this the most successful convention both in point of attendance and programme to be presented, and we earnestly solicit the aid and co-operation of the "The Herald," "The Albertan" and "The News," in our endeavors to interest and bring together everyone in the provinces of Alberta, British Columbia and Saskatchewan, who is interested in the many problems pertaining to irrigation, in order that they may be thoroughly discussed and a satisfactory solution arrived at. Members of our executive resident in Calgary:—Messrs. C. W. Peterson, President, C. W. Rowley, Treasurer, and R. R. Jamieson, Second Vice President. We will give you any further information you may desire or wish, and shall be pleased to furnish you the same from our office here, upon application.

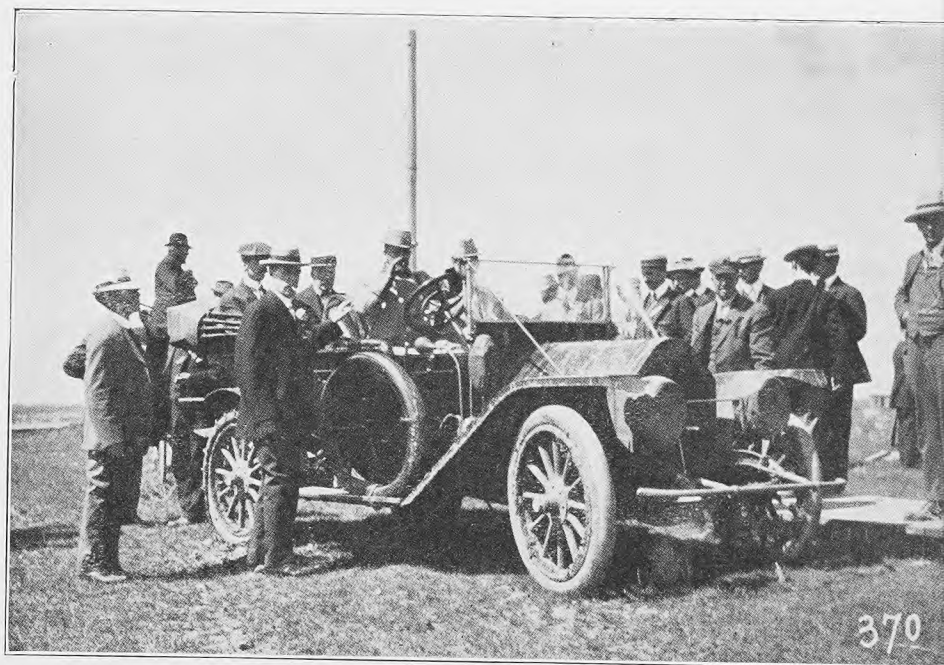
'Thanking you in anticipation for your co-operation, I beg to remain,

'Yours sincerely,

(Signed) 'JOHN T. HALL,
'Secretary.'



Delegates to the Western Canada Irrigation Association's Convention 1911
at Bassano—After Luncheon.



Members of the 1911 Irrigation Convention at Bassano.

From E. F. DRAKE, Forestry Branch, Ottawa, to John T. Hall, Secretary, under date of June 30th, 1911.

'DEAR MR. HALL,—I send you herewith a copy of a letter received some little time ago from Dr. Stanley Coulter, Dean of the School of Science of Purdue University, at Lafayette, Indiana. As Dr. Coulter speaks very appreciatively of the report of the proceedings of the fourth annual convention held last year, it might interest you.

'Yours very truly,

(Signed) 'E. F. DRAKE.'

From STANLEY COULTER, Purdue University, Lafayette, Indiana, to R. H. Campbell, Director of Forestry, Ottawa, under date of April 26th, and forwarded to John T. Hall, Secretary:—

'MY DEAR SIR,—I beg to acknowledge with thanks, receipt of the proceedings of the fourth annual convention of the Western Canada Irrigation Association.'

'I wish to congratulate you, not only upon the completeness of the report and the value of the material presented, but also upon the excellent form in which the report is printed. It is so much superior to anything that we do on this side of the line that is as quite noteworthy.'

'Very sincerely yours,

(Signed) 'S. COULTER.'

To E. F. DRAKE, Forestry Branch, Ottawa, from John T. Hall, under date of July 10, 1911:—

'DEAR SIR:—I beg to acknowledge receipt of your favor under date of June 30th, which was addressed to me at Brandon and forwarded on to Lethbridge, where you will note by enclosures, we are now operating.'

'The reports which you sent to me at Brandon were received, when we had them re-shipped to Lethbridge, and as they evidently have gone astray and the railway company appear to be unable to trace them, we would esteem it a favor if you will kindly inform me by return mail, if you forwarded a supply to Calgary, in order that they may be available at the coming convention, August 8th 9th and 10th, as arranged with you through former correspondence. If you have not already done so will you kindly send a package addressed to Norman S. Rankin, care the Canadian Pacific railway company, Irrigation Department, Calgary. I beg to remain.

'Yours very truly,

(Signed) 'J. T. HALL.'

TO HON. A. L. SIFTON, Premier of Alberta, from John T. Hall, Secretary, under date of February 9th, 1911.

'DEAR SIR,—

'RE FINANCIAL AID FOR WESTERN CANADA IRRIGATION ASSOCIATION.

'In the year 1907, a number of individuals interested in the propagation of a wider knowledge regarding the principles of irrigation throughout the western provinces, met in the city of Calgary and organized the Western Canada Irrigation Association, and for four years, this Association has been engaged upon an educational campaign in endeavoring to impress upon the people the proper conservation of water and its economical distribution upon the land. This has been realized to be a great necessity in the development and cultivation of the land, more particularly in the southern portion of Saskatchewan and Alberta, and in the fruit growing districts of British Columbia. In all three provinces, there are hundreds of irrigation schemes, as shown by the map issued by the Department of the Interior.

'The first convention of this Association was held in Calgary, June 17th and 18th, 1907, in Vernon, B.C., August 10th and 11th, 1908; in Lethbridge, October 5th and 6th, 1909, and for 1910, the convention was held in Kamloops, B.C., August 3rd, 4th and 5th.

'The Department of the Interior recognized the importance of this work by publishing the proceedings of these conventions as a government report, assuming all the costs thereof.

'As this Association has no direct source of revenue, and its work is for the general good, we have been requested by the officers and executive committee of the Association to request your government for financial assistance for the convention of 1911, which will be held in Calgary.

'For your information, we may say that the government of British Columbia made a substantial grant for the 1908 convention; the Alberta government made a grant for the 1909 convention, and the British Columbia government a grant of \$2,000 for the convention of 1910.

'The executive are yearly extending the scope and work of the Association, and as they are working along the lines of agricultural development, we sincerely trust that the welfare of the organization will receive your serious consideration.

'I beg to remain sir,

'Yours very respectfully,

(Signed) 'JOHN T. HALL,
Secretary.'

TO HON. DUNCAN MARSHALL, Minister of Agriculture, Alberta, from John T. Hall, Secretary, under date of February 9th, 1911:

'DEAR SIR,—We are to-day writing to the Hon. A. L. Sifton regarding the financial assistance needed for the Western Canada Irrigation Association to carry on the work of the convention for 1911, which will be held in the city of Calgary.

As you attended the last convention in Kamloops, you must be fully cognizant with the work of the Association, and we shall esteem it a great favor, if you will consult with the Premier and use your influence in furthering the interests of the Association in the educational campaign which it is endeavoring to carry on along the lines of agricultural development in the semi-arid districts of the west.

'Trusting to hear from you at an early date, I beg to remain,

'Yours very respectfully,

(Signed) 'JOHN T. HALL,

'Secretary.'

From THE DEPUTY MINISTER, Department of Agriculture, Alberta, to John T. Hall, Secretary, under date of February 17, 1911.

'DEAR SIR,—Your favor of the 9th inst, addressed to Hon. Duncan Marshall, Minister of Agriculture, has been duly received, and in reply I beg to state that the minister is absent in Ontario for a few weeks, but your letter will be brought to his attention immediately upon his return to the office.

'I am sir, your obedient servant.

(Signed) 'GEORGE HARCOURT.'

From HON. A. L. SIFTON, Premier of Alberta to John T. Hall, Secretary, under date of February 21, 1911.

'MY DEAR SIR,—Your letter with regard to the irrigation matter has been received, and has been handed to the Minister of Agriculture for consideration.

'Yours very truly.

(Signed) 'A. L. SIFTON.'

From HON. DUNCAN MARSHALL, Minister of Agriculture, Alberta, to John T. Hall, Secretary under date of March 17, 1911:—

'DEAR SIR,—Your letter reached me during my absence regarding a grant to the Western Canada Irrigation Association which meets in Calgary this summer, and in reply would say that the government will give your Association \$1,000. Trusting this will be satisfactory, and wishing your convention success, I am.

'Yours very truly.

(Signed) 'DUNCAN MARSHALL.'

To HON. DUNCAN MARSHALL, Minister of Agriculture, Alberta, from John T. Hall, Secretary under date of March 22nd, 1911:—

'DEAR SIR,—We beg to acknowledge receipt of your favor under date of March 17th, stating that your government have decided to make a grant of one thousand dollars to the Western Canada Irrigation Association, and desire to convey the thanks of the Association, for your kind and generous treatment.

'We have already felt that good results would follow your presence at our last convention, and your kind letter confirms this. Kindly make cheque payable to Mr. C. W. Rowley, manager of the Bank of Commerce, Calgary, who is Treasurer of the Association and notify me when the same is sent to him so that it may be entered on our books.

'We sincerely trust that we shall have the privilege of seeing and hearing you at the Calgary convention. I beg to remain,

'Yours respectfully,

(Signed) 'JOHN T. HALL,
'Secretary.'

TO HON. DUNCAN MARSHALL, Minister of Agriculture, Alberta, from John T. Hall, secretary, under date of July 10, 1911.

'DEAR SIR,—In your communication to us under date of March 17th last you informed us of the fact that the government were preparing to make a grant of \$1000. We will esteem it a great favor if you will kindly forward the same to Mr. C. W. Peterson, president, care of Canadian Pacific railway, Lands Department, Calgary. Trusting that we may again have the pleasure of meeting and hearing you at the coming convention in Calgary. I beg to remain.

'Yours very truly,

(Signed) 'JOHN T. HALL,
'Secretary.'

FROM HON. DUNCAN MARSHALL, Minister of Agriculture, Alberta, to John T. Hall, secretary, under date of July 15th, 1911.

'DEAR SIR,—I am having grant of \$1000 to the Irrigation Convention mailed as per your request. I hope to be able to attend the Irrigation Convention, though it is being held on the same dates as the Dominion Fair and it may be possible that I could not get back in time.

'Yours very truly,

(Signed) 'DUNCAN MARSHALL.'

LIST OF INVITATIONS TO ATTEND THE WESTERN CANADA IRRIGATION ASSOCIATION CONVENTION 1911, SENT TO THE FOLLOWING:

NEWSPAPERS

BRITISH COLUMBIA.

- "The Pioneer & Mining Journal" Phoenix.
- "The News" Nelson.
- "The Colonist" Victoria.
- "The Times" Victoria.
- "The News" Vernon.
- "The World" Vancouver.
- "The Province" Vancouver.
- "The Review" Summerland.

- "The Times" South Vancouver.
- "The Observer" Salmon Arm.
- "The Miner" Rossland.
- "The Mail Herald" Revelstoke.
- "The News" Queen Charlotte.
- "The Empire" Prince Rupert.
- "The Press" Penticton.
- "The Express" North Vancouver.
- "The News" New Westminster.
- "The British Columbian" New Westminster.
- "The Herald" Nanaimo.
- "The Free Press" Nanaimo.
- "The Herald" Merritt.
- "The Orchard City Record" Kelowna.
- "The Courier & Okanagan Orchardist" Kelowna.
- "The Kootenian" Kaslo.
- "The Standard" Kamloops.
- "The Inland Sentinel" Kamloops.
- "The Gazette" Grand Forks.
- "The Evening Sun" Grand Forks.
- "The Tribune" Ft. George.
- "The Free Press" Fernie.
- "The District Ledger" Fernie.
- "The Prospector" Cranbrook.
- "The Herald" Cranbrook.
- "The Journal" Ashcroft.
- "The Advertiser" Armstrong.

ALBERTA.

- "Free Press" Taber.
- "Strathmore & Bow Valley Standard" Strathmore.
- "The Review" Okotoks.
- "The Advance" Okotoks.
- "The News" Nanton.
- "The Times" Medicine Hat.
- "The News" Medicine Hat.
- "The Pioneer" Magrath.
- "The Advertiser" McLeod.
- "South Alberta Labor Bulletin Fortnightly" Lethbridge.
- "The News" Lethbridge.
- "The Herald" Lethbridge.
- "The Times" High River.
- "The Call" Gleichen.
- "The Press" Daysland.
- "The Review" Claresholm.

- "The Journal" Carstairs.
- "The Alberta Star" Cardston.
- "The Canadian" Camrose.
- "The News" Bassano.

MANITOBA.

- "Western Municipal News" Winnipeg.
- "The Northwest Review" Winnipeg.
- "The Grain Growers' Guide" Winnipeg.
- "Free Press & Prairie Farmer" Winnipeg.
- "The Farmers' Telegram" Winnipeg.
- "The Farmers' Advocate & Home Journal" Winnipeg.
- "The Commercial" Winnipeg.
- "Canadian Farm Implements" Winnipeg.
- "Canada West" Winnipeg.
- "Bulman's Farm & Motor Magazine" Winnipeg.

SASKATCHEWAN.

- "The Evening Capital" Saskatoon.
- "The Standard" Regina.
- "Saskatchewan Courier" Regina.
- "Morning Leader" Regina.
- "The Leader" Regina.
- "The Times" Moosejaw.
- "The News" Moosejaw.
- "The Evening Times" Moose Jaw.
- "The Leader" Maple Creek.
- "The Advocate" Manor.

MAYORS, BOARDS OF TRADE AND AGRICULTURAL SOCIETIES OF

Regina, Sask.	Peachland, B.C.
Vancouver, B.C.	Summerland, B.C.
Vernon, B.C.	Victoria, B.C.
Penticton, B.C.	Revelstoke, B.C.
Macleod, Alta.	Magrath, Alta.
Medicine Hat, Alta.	Pincher Creek, Alta.
Raymond, Alta.	Red Deer, Alta.
Taber, Alta.	Calgary, Alta.
Ashcroft, B.C.	Armstrong, Sask.
Cranbrook, B.C.	Swift Current, Sask.
Kamloops, B.C.	Moose Jaw, Sask.
Kaslo, B.C.	Maple Creek, Sask.
Kelowna, B.C.	Irvine, Sask.
Nelson, B.C.	Cardston, Alta.
Edmonton, Alta.	Gleichen, Alta.
Granum, Alta.	High River, Alta.
Lethbridge, Alta.	Brandon, Man.

GOVERNMENT OFFICIALS.

- Hon. Richard McBride, Premier of British Columbia, Victoria, B.C.
 Hon. Thomas W. Patterson, Lieutenant-Governor B.C., Victoria, B.C.
 Hon. H. C. Young, M.D., LLD., Provincial Secretary, Victoria, B.C.
 Hon. George Henry Vicars Bulyea, Lieutenant-Governor Alberta, Edmonton,
 Alta.
 Hon. A. L. Sifton, Premier of Alberta, Edmonton, Alta.
 Hon. S. R. Mitchell, Attorney General, Edmonton, Alberta.
 Hon. A. J. Maclean, Provincial Secretary, Edmonton, Alta.
 John Stocks, Esq., Deputy Minister of Public Works, Edmonton, Alta.
 Hon. Duncan Marshall, Minister of Agriculture, Edmonton, Alta.
 Hon. George William Brown, Lieutenant-Governor of Saskatchewan, Regina,
 Sask.
 Hon. Walter Scott, Premier of Saskatchewan, Regina.

LIST OF DELEGATES ATTENDING THE 1911 CONVENTION.

- R. H. Agur, Summerland, B.C.
 R. A. Brocklebank, Calgary, Alta.
 Lieu.-Gov. Bulyea, Edmonton, Alta.
 G. H. Babbit, Edmonton, Alta.
 C. H. Cordy, Summerland, B.C., (Board of Trade).
 F. W. Crandall, Calgary, Alta.
 R. H. Campbell, Ottawa, Ont.
 A. S. Dawson, Calgary, Alta.
 J. S. Dennis, Calgary, Alta.
 W. J. Elliott, Strathmore, Alta.
 W. C. Graham, Kamloops, B.C.
 W. F. Gilkison, Strathmore, Alta.
 George Harcourt, Edmonton, Alta.
 R. J. Hutchings, Calgary, Alta., (Board of Trade).
 J. T. Hall, Lethbridge, Alta.
 P. C. B. Harney, Calgary, Alta.
 A. Helmer, Calgary, Alta.
 P. J. Jennings, Calgary, Alta.
 A. C. Milligan, Calgary, Alta.
 F. W. McNaughton, Strathmore, Alta.
 V. A. Newhall, Calgary, Alta.
 C. W. Peterson, Calgary, Alta.
 G. A. Patrick, Strathmore, Alta.
 F. H. Peters, Calgary, Alta.
 N. S. Rankin, Calgary, Alta.
 T. E. Robinson, Strathmore, Alta.
 H. C. Ritchie, Calgary, Alta.
 R. S. Stockton, Strathmore, Alta.

P. M. Sauder, Calgary, Alta.
 E. C. Thrupp, Kamloops, B.C.
 W. Toole, Calgary, Alta.
 W. J. Whitney, Lethbridge, Alta.
 James White, Ottawa, Ont.
 Arthur V. White, Ottawa, Ont.
 W. H. Fairfield, Lethbridge, Alta.
 H. Brown, Calgary, Alta.
 H. A. Craig, Edmonton, Alta.
 P. Dixon, Vernon, B.C.
 W. Park Evans, Gleichen, Alta.
 E. Greisbach, Gleichen, Alta.
 F. W. Groves, Kelowna, B.C.
 O. Kirkvold, Calgary, Alta.
 A. W. P. Lowrie, Calgary, Alta.
 W. T. Marshall, Armstrong, B.C.
 W. H. Moody, Kelowna, B.C.
 Hon. Duncan Marshall, Edmonton, Alta.
 W. R. McKee, Gleichen, Alta.
 R. C. Pegler, Bassano, Alta.
 B. Russell, Calgary, Alta.
 C. A. Stoess, Kelowna, B.C.
 Maxwell Smith, Vancouver, B.C.
 R. White, Calgary, Alta.
 R. J. Burley, Maple Creek Dis., Sask.
 J. T. Childs, Calgary, Alta.
 J. Cawthorne, Calgary, Alta.
 P. Z. Caverhill, Calgary, Alta.
 James Duff, Brooks, Alta.
 R. C. Hurd, Irricana, Alta.
 W. L. Lloyd, Lethbridge, Alta.
 J. C. Metcalfe, Victoria, B.C.
 Thomas Morley, Nelson, B.C.
 H. B. Muckleston, Brooks, Alta.
 W. H. Hawswon, Coaldale, Alta.
 B. A. Etcheverry, Berkeley, Cal., U.S.
 F. J. Fulton, Kamloops, B.C.
 J. E. Jones, Gleichen, Alta.
 W. H. Jones, Gleichen, Alta.
 James Hutchison, Montreal, Que.
 Hon. M. Burrell, M.P., Grand Forks, B.C.
 F. S. Jacobs, Grand Forks, B.C.
 Hon. W. R. Ross, Victoria, B.C.
 A. A. Wallace, High River, Alta.

Moved by Mr. Agur, seconded by Mr. Elliott, that the secretary's report and financial statement of the past year be adopted. Carried.

COMMITTEE ON CREDENTIALS.

CHAIRMAN.—The Chair is open to receive nominations for the Committee on Credentials, and I suggest a small committee of three or four.

Moved by Mr. Dennis, seconded by Mr. Cordy, that the Chair nominate the Committee on Credentials.

CHAIRMAN.—I nominate Messrs. Cordy and Agur of British Columbia, Mr. Campbell of Ottawa, and Mr. Elliott of Strathmore to act as a Committee on Credentials. What is your pleasure with regard to the Committee on Resolutions?

Moved by Mr. Agur, seconded by Mr. Harcourt that the same course be taken in regard to the Committee on Resolutions. Carried.

COMMITTEE ON RESOLUTIONS.

CHAIRMAN.—I nominate as a Committee on Resolutions, Messrs. R. S. Stockton, Jennings, Harcourt, Hutchings, Cordy, and Agur. I now suggest that the two committees get to work, and I think it would be well to adjourn until two o'clock. The system has been adopted here of providing a book at the door in which everyone registers, stating where he comes from, and it will be the business of the Committee on Credentials to examine that book and satisfy themselves—that is the simplest way and the way we have adopted in the past, I think.

Are there any other resolutions to be considered? We have received a number that have been published. In the past years we have adopted the practice of accepting resolutions at the time of the opening of the convention—if you have any—please hand them to the secretary before you leave the hall in order that they may be placed in the hands of the committee on resolutions. Any resolutions that come in may be handed in at any time during to-day, at any event.

Moved by Mr. Elliott, seconded by Mr. Harcourt, that the convention adjourn to meet again at two p.m. Carried.

TUESDAY AFTERNOON SESSION.

2 p.m. Meeting called to order:—

MR. HUTCHINGS.—As chairman of the committee on resolutions, I am glad to tell you that we have passed without making any change the various resolutions as noted.

We have also, on your suggestion, revised the programme and the secretary, Mr. Hall, will read the programme and arrangements as now revised; afterwards we will have this typewritten and each member will receive a copy so that you will all be quite familiar with the programme and arrangements that it is intended to carry out during the convention.

In regard to the motor trip proposed for 7.30 this evening, we have in the city I think about 15 or 20 miles of paved streets and if we do not have any more rain this afternoon the opinion is that we can have a very enjoyable hour's ride without necessarily getting into the muddy part at all, and I would suggest that you ask for a count of hands as to those that would like to participate in that motor ride

so that we can make all arrangements and have a sufficient number ready. In regard to the proposed trip to Bassano the opinion generally expressed is that we are looking forward to it with a great deal of interest if the weather is at all suitable and there will be a large attendance and a great deal of interest taken in the proposed trip if it can be arranged.

Mr. Hall will now give you the particulars of the arrangements.

Programme for the day read by Mr. Hall.

Moved by Mr. Hutchings, seconded by Mr. Stockton, that the report of the committee on resolutions and arrangements be adopted. Carried.

CHAIRMAN,—Before we proceed with the programme, I desire to say that I wish to be relieved of the chairmanship. As I said before I am here by accident and on account of the removal from Calgary of the president duly elected at the last convention. It has been the custom, I should mention in the past, to elect a chairman for the convention at one of the opening sessions, apart from the presidency of the association. I would like to have nominations for chairman of the convention.

Moved by Mr. Agur, seconded by Mr. Dawson that Mr. R. H. Campbell of Ottawa be chairman. Carried.

MR. PETERSON.—Mr. Campbell, I have much pleasure in conducting you to the chair.

MR. CAMPBELL (Chairman).—Your honor, and gentlemen of the convention

I think it would have been just as well to have left the president in the chair. I think the main reason that the chairman was specially selected at previous conventions was the fact that Mr. R. B. Bennett was available for that position, and it was considered that he was a past master at functions of that kind, and we could not do better than keep him at the job right along.

For some reasons, I think perhaps, it might have been better to have somebody else than a person in the government service as chairman of the convention, but I will do my best to carry it on satisfactorily, and of course if you find I am not doing it satisfactorily you can depose me any time that you like.

The first item on the programme this afternoon is a paper by Prof. Elliott, and I ask him to read the paper before the convention.

"THE REAL SIGNIFICANCE OF IRRIGATION."

ADDRESS BY PROF. ELLIOTT.

The subject that has been assigned to me for this afternoon's address is "The Real Significance of Irrigation."

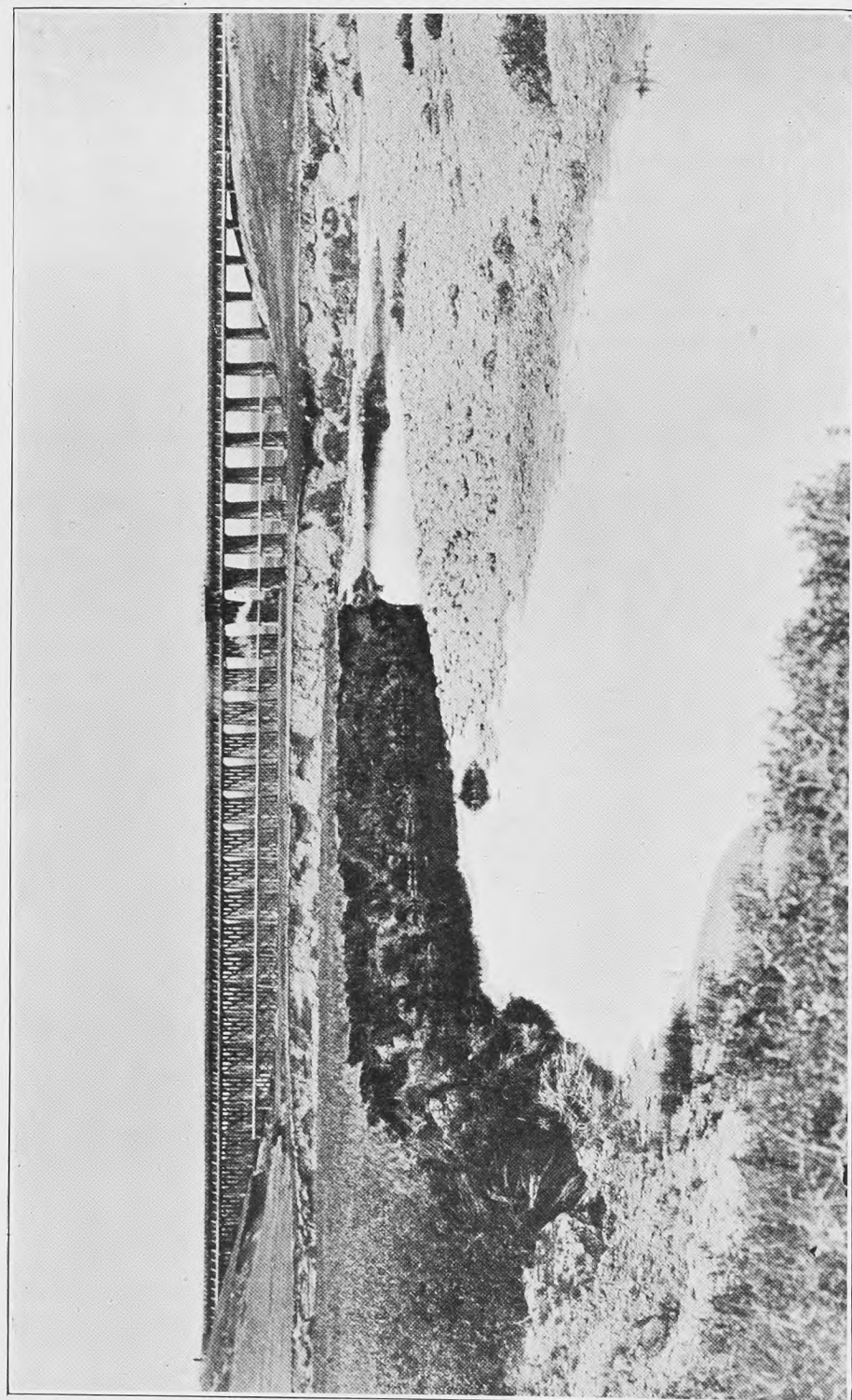
It is a fact that there are four essentials for the growth of all crops—heat, air, plant food and moisture. These may vary with different crops, altitudes and localities, yet the fact remains that the four are necessary. Now, as this paper is to deal with the real significance of irrigation, we shall eliminate three of the essentials and confine ourselves to the one which is most directly concerned under a system of irrigation, that is, the water.

We find that there is no marked relationship between the percent of water applied to the crop, whether this be artificial or natural, and the resultant crop. If, suppose that we have a 6 inch rainfall, then if other conditions are favorable, this is sufficient moisture to produce a 20 bushel crop of wheat provided however, every drop of the six inches was saved to the use of wheat. Proportionately, other things being equal, a 12 inch rainfall is sufficient to produce a 40 bushel crop. However, there are other conditions that enter into and influence this relationship, such as evaporation and subsoil conditions that very materially interfere with this proportionate relationship. Both evaporation and subsoil conditions must be taken into consideration very seriously in the practical application of water to land. These two, with the general slope and contour of the land, together with the irrigating head, will determine the ease with which water may be distributed, and also the amount of land that may be irrigated in a given time.

In considering the amount of land that may be irrigated successfully in one season, it brings us to what we think is a most serious drawback to all irrigation schemes, and that is the large farms, or, in other words the large acreages that men attempt to irrigate. We do not find so much fault with the large acreage as we do with the crop that must necessarily be grown upon these large areas. All men desire to become wealthy quickly and for the majority of irrigators, the grain fields presents the quickest way of obtaining this object. Hence nearly every irrigation project upon this continent has been very seriously hindered at the start by the grain farmer, who, in his insane desire for wealth, will take the grain "short cut" to the object of his desires, a short cut that practically in a great many cases out of every 100, is impossible, and at the same time, a short cut that is a short cut to the end of the soil fertility. Grain growing is a system of soil robbing, instead of a system of farming. Whether it is irrigated lands or not, the same thing is true, grain farming is soil robbing. We can all point to districts in Canada and the United States where a few years ago 30 to 35 bushels of wheat were grown per acre; to-day the average is 12 to 14, and, as a consequence, the farmer must feed the nitrates, phosphates and potashes before he can even grow the small yields that are possible to-day. Some eastern experiment stations turn out as half of their annual grist of bulletins, those dealing with commercial fertilizers, and when that is the bulk of the information coming from an institution it tells its own tale. Some grain farmer robbed that soil, and as consequence the present day farmers have to feed it to produce the crop.

With our irrigated farming, the same thing will inevitably be true if we stick to grain growing, and, as we have already said, nearly every irrigation project is cursed with certain individuals who want to gain wealth at the expense of future generations.

In this connection, we cannot say that those who launch many irrigation projects are not altogether blameless, for frequently the literature that is placed in the prospective buyer's hands flaunts about nothing except the golden wheat harvest and the golden shekels that come so easily with the harvest of golden grain. This may bring eager buyers from among those farmers who are not practical irrigators, but the result is the same, it brings into the district those who wish to obtain the wealth promised as quickly as possible, and who almost in-



variably attempt to do it with grain growing. There never was an irrigated project built that attained to its highest development under a system of grain farming. Literature bearing upon any irrigation project should only mention grain growing incidentally. The dairy cow, the hogs, the sheep, the fat stock, the poultry and intensified farming, should be the burden of every pamphlet sent into circulation. In the west from Alberta to Kansas, the one thing that the grain grower fears perhaps more than any other is the hail, but if our system were built upon right lines, the dairy cow and the hogs, the sheep, the fat stock, the poultry, are not likely to be hailed out. Then "the true significance of irrigation" will be fully appreciated when we fully appreciate the real purpose of irrigated land and intensified farming. Under a system of diversified farming where a great variety of crops are grown for the purpose of feeding stock and so turning the raw material onto the market as a finished product, irrigation may find its highest development. Grain growing requires all the irrigation water in from four to six weeks, while diversified farming needs it from early spring until late fall.

Then again, there is not only the question of grain farming as compared with diversified farming but there is the size of the farm. This is exceedingly important. 99 farms out of every 100 are too large for successful operation, and the work becomes a "struggle to get through" and consequently the result is half worked lands, weeds, and low yields. These conditions are exaggerated too because of the fact that competent help is hard to obtain. Here, again, "the true significance of irrigation" will lead a man to reduce his acreage to a point where he can rightly and carefully handle it, and it is a fact that with a smaller acreage more carefully handled, it is possible to receive larger returns than from a larger acreage poorly handled, and, besides, the work may be well done, and the resultant satisfaction to the individual is much greater.

We are, therefore, confident that "the true significance of irrigation" must inevitably lead up to the small farm, every acre of which is used, and every acre of which will produce more dollars than by any other system.

It is astonishing what may be produced on an acre of land under a system of intensified agriculture. Here are three crops grown upon our demonstration farms at Strathmore this year which will open the eyes of some of us in this district as to the possibilities of this soil and climate. We must remember, in this connection, that these crops are grown under practical farming conditions. The first is a patch of strawberries one acre in extent. To date we have taken from this patch \$350, the berries are good for another two weeks, and a careful estimate will indicate that we will yet receive from this patch at least \$150, making a total of \$500 gross. The labor of picking, boxes for shipping, etc., will amount to \$200, leaving us a net profit of \$300 per acre.

The second crop is a crop of green garden peas. Up to date this acre has produced \$300, and it has been carefully estimated that it will produce at least \$110 more, making a total of \$410. For labor of picking, etc., this acre will cost us \$150, leaving a net profit from the acre, of \$260.

The third crop is table turnips. We only have half an acre of these turnips growing, which on a careful estimate will produce three tons. You will note that this is a low yield for this class of vegetable, but we are pulling them quite small,

as they are desired in this way, consequently the yield will not be as though were to let the crop mature. However, the half acre will produce 3 tons of turnips which at 3c. per pound will bring us in \$180, the cost of lifting, \$40, leaving us a net profit of \$140 for the half acre, or \$280 profit for the acre. We have simply cited these instances to show the possibilities of small acreages of land when handled carefully. Some of you may know that in the publications regarding our irrigation project lying to the east of this city, we have given considerable thought to the possibilities of an 80 acre farm. When such a farm is handled simply as a general farm, with dairy cows, hogs, and such crops as potatoes, etc., it is quite possible for the individual to have as representing his labor for the year \$1,500 to \$2,000. Remember this is when the farm is handled only as a small general farm. If the growing of special crops may be undertaken, this sum will be increased very materially. In this connection I am informed by Director F. B. Linfield of the Montana Agricultural College, that many of the farmers of the Huntly Irrigation project are becoming wealthy on 40 acres of ground. We are thoroughly convinced that under a system of irrigation no farm ought to be larger than 160 acres and if the highest development is to be secured, half, or a quarter of this amount will be found to be more satisfactory. Aside from the crops as mentioned above there are other special lines that may be conducted with considerable profit on these smaller farms. For instance, for the man who is willing to take up the hand selection of grain there is almost an infinite market and field in the west. Farmers are generally beginning to realize the value of pure seed, and the man who will get his reputation up as producing the best seed in the district will sell all that he may produce at a very enhanced price.

A few samples submitted may give you an indication as to how this work may be carried out, and as to what the C. P. R. demonstration farm at Strathmore is doing along these lines for the settlers in this district. It is gratifying to note that there are a considerable number of farmers in the irrigation district who are carrying on this same line of work. Work of this kind is made possible where irrigated land is available because of the fact that the small acre plots may be cared for much more carefully than in districts where the rainfall must be depended upon.

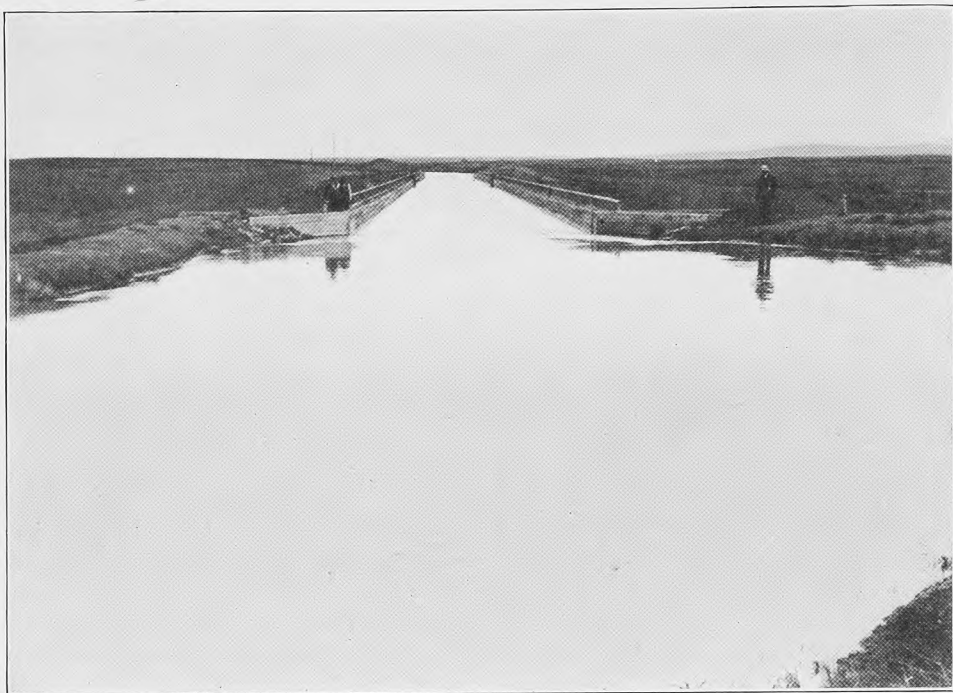
I have here a few samples of grain I want to show you, samples we handled at the demonstration farm at Strathmore. It is a practise that we are endeavoring to get every individual to carry out, if he will do it; each year we take from our crops, a certain amount of grain and hand pick a sufficient amount of seed for an acre; the seed is weeded out, the acre plot, or proportion of an acre, whatever it may be, are all measured out very carefully, and the same amount of grain sown on each one. I just want to show you the difference in grains; we have here an oat (exhibiting sample) that is an oat; yes, there are different oats, that is true, but there is a difference in oats just the same. For instance, here is an oat from the first prize oat grown in the Strathmore district season 1909. Last spring we had a couple of bushels of that oat carefully hand picked, enough for a plot of ground at the demonstration farm. This is the ordinary Banner oat (exhibiting) and here is another oat (exhibiting) the Swedish select oat. That oat (exhibiting sample) comes from an oat that will produce 122 bushel to the acre; these were

grown on the same sized plot, practically side by side. This first prize oat of the district produced 76 bushels to the acre, and this (exhibiting) produced 110 last year. This year we are growing the two samples again, and this I simply ran out and gathered in the rain, just before leaving Strathmore. These are Banner oat, and the Swedish select oat, second year of hand selecting. You see, I believe the Banner is going to give a little closer chase this year for yield; we cannot speak definitely as yet, neither of them have great advantage in height, and they are growing extremely well, standing up well—one thing about this oat (exhibiting) is that it has a particularly stiff straw, stands up well. It is wonderful what you can do in the way of improving grain if we will take and hand select the kernels; it only takes a small time in the winter to hand pick a sufficient amount of grain to seed an acre or half an acre, on the same principle as holds good in breeding stock—you have a herd of stock, you are not going to breed everything in the herd, you are going to eliminate the runts and poor things, and select your best; the same thing is true in breeding grain, if you are going to breed everything in the field you will have a cross fertilization from the wheat and the straw, and the crop will suffer to that extent. To improve grain, hand pick the kernels, and get nothing but the good kernels for the cross fertilization and the crop will be that much stronger. In connection with these two oats, we are trying another one this year—it has a very, very strong stem, that oat is standing up in the field to-day, the wet weather has not affected it the least bit—a very strong stem, this is the Garten No. 22—we are growing it in connection with the other two—it is just a little later heading out, but it looks good and full, and we are growing that oat in comparison with the other two.

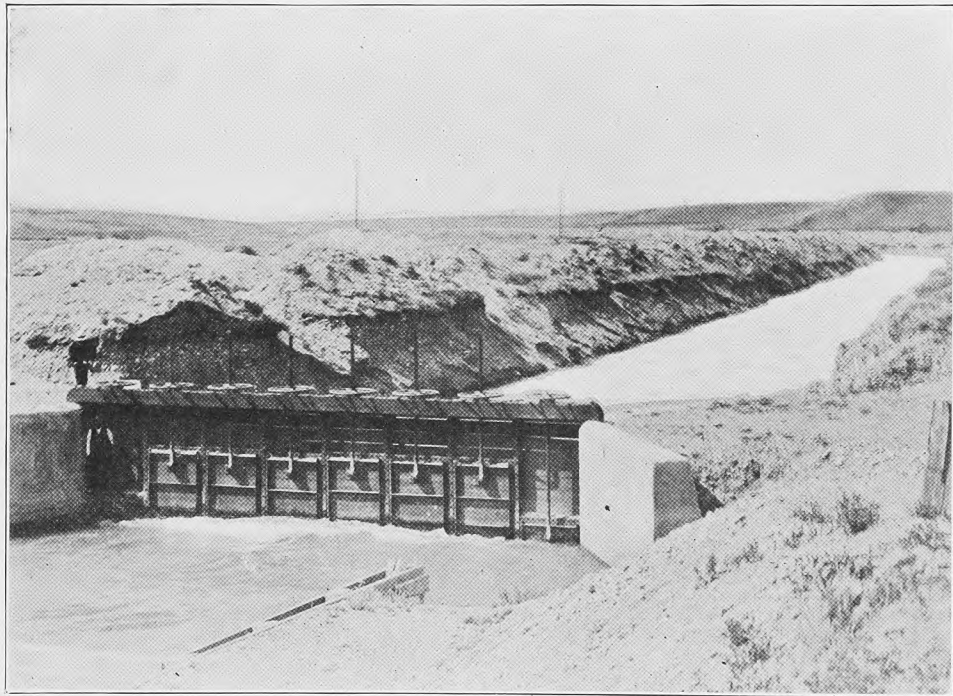
We are also doing practically the same thing with barleys; here are two varieties of barleys; (exhibiting) this is the Hansen, a new variety from Sweden, but the thing seems to be that the straw is scarcely strong enough to stand up well in this country. This is the Two-Rowed Chevalier from Montana—we are growing the two in the same way—we are picking the kernels and growing them in comparison on the Demonstration farm, and if we get anything in the line that is good, it will be our purpose to bulk it up on the farm and distribute it throughout the district.

The man who comes into Alberta from across the line misses his corn. We are trying two things here to help him out in that respect, the white hulless barley, a barley that threshes out just exactly like wheat, and has a very high feeding value, produces splendid poultry, and the ordinary fall wheat; we are having very fine success with this in our Strathmore district, and it is something we are going to use in our rotation, for we can follow out a very nice rotation with alfalfa. It is along these lines in the hand picking of grain and in the growing of special crops that we are going to make the most money on the land under irrigation. This way, we will demand a smaller farm on a smaller acreage and yet from it we will have as a return, a good large profit, and it is in realizing these things that I think we will realize the true significance of irrigation.

CHAIRMAN.—This paper is open for discussion for a short time, if anybody wishes to ask any questions.



Alberta Railway & Irrigation Co.'s project:—Flume.



Alberta Railway & Irrigation Co.'s project:—Main headgate.

Mr. PETERSON.—We are all very much interested in malt and barley crops, will you explain to the meeting where the Chevalier is grown?

Prof. ELLIOTT.—This Two-Rowed Chevalier has grown for years in the Gallatin valley of Montana, where it has a world wide reputation. The Germans were in the valley buying up the next year's crop—it is considered by the German brewers as a barley of very high commercial value for brewing. I happened to meet Mr. Baird, one of the Glasgow maltsters in Calgary, and he said "Just to show you how barley is costing—can you tell me how it is that we do not get any more of the Gallatin valley barley in Glasgow?" I said "Yes, I can, the German brewers are in there buying up the next year's crop a year ahead."

Voice.—What price are they getting?

Prof. ELLIOTT.—They are getting ten cents a bushel more than the market, no matter what the market will be. What is the matter with that?

Voice.—What is the average market price?

Prof. ELLIOTT.—I could not tell you, generally for the reason that a good many sales are made somewhat privately. Frank Stevenson, secretary of the Farmers' Alliance for the Gallatin valley for the past three years, has sold his barley at about 70c. a bushel. This barley with us on the demonstration farm last year, produced 48.8 bushels to the acre.

Mr. PETERSON.—What is your opinion as to the possibility of producing an equal sample of barley in Alberta?

Prof. ELLIOTT.—I believe we can produce barley here just as well as they can produce it in the Gallatin valley. We are giving that oat the same conditions and the general yield would indicate that the barley that we will produce in the Bow valley will be just as good as that barley there (indicating). We are growing this (indicating) and having very good success with it, and the report from the sample sent to the old country last fall was very encouraging. I have great good faith in that barley; if we grow it very carefully we will have something here that will be of immense commercial value to the Bow valley district. We are about 500 miles north of where this is grown, and we have a drop of about 1,500 feet in altitude; we have given it practically the same conditions as it had in Montana.

W. H. FAIRFIELD.—You made the statement that it was estimated that some of the 40 acre farms in the Yellowstone valley gave a net yield of about \$2,000 to the farmer. Will you state what the general crops were?

Prof. ELLIOTT.—The crops there grown were quite largely on the intensified order, of course. They used alfalfa in the rotation and kept a certain number of cows, produced a certain amount of feed with a rotation of alfalfa, and bought the rest of the hay. Alfalfa is fairly cheap in the Gallatin valley, anywhere from \$3.50 to \$5.50 per ton. With a good dairy cow you can make alfalfa worth \$20 and \$25 a ton.

They grow strawberries and garden truck. They are a short distance from Billings, one of the progressive cities of Eastern Montana, and a great deal of the products went into the form of garden produce. Then there is the city of Butte, which gave them almost an unlimited market for all the garden produce of the smaller variety of things that they could possibly produce. There is nothing

there that we cannot raise here—strawberries form a good big bulk of their trade, and they were getting into the idea of shipping co-operatively, gathering the berries altogether and the buyers come in and buy the entire outfit, and ship them co-operatively to Butte—they were growing nothing there but what we can grow right here in Alberta—our strawberry crop has done wonderfully well, and that is something a little new for us in Alberta; I doubt if many of us here in this district of Alberta, imagine that we can grow strawberries as we can grow them; it is just a treat to see that strawberry bed, and see the crates that we are getting off it every day or so, it is astonishing. I am just as firmly convinced as I can be that this district and Mr. Fairfield's district will become one of the big strawberry districts of the west; we can go onto the market when there are no other berries on the market; we simply control our crop and put these strawberries on the market when we want to.

Mr. AGUR.—What is the variety of the strawberry?

Prof. ELLIOTT.—It is the Wilson berry.

Mr. THRUPP.—I am very much interested in Prof. Elliott's paper and I agree with him in almost everything. The question of fertilizers for grain crops is a very important feature. I should like to know if Mr. Elliott has made any experiment with these electrically produced fertilizers?

Prof. ELLIOTT.—No, I have made no experiments whatever with regard to the electrical appliances for supplying fertility to the soil. My own opinion of the matter is this: judging from the conditions in the Red River valley, where I can remember that 30 and 35 bushels of wheat were produced, and produced easy, to-day the average wheat crop is 13 bushels. It would be a dangerous thing for Alberta and the prairie provinces, to allow our soil to go on deteriorating pending the time when we will have any electrical appliances to supply fertility. My idea is to use good common sense to-day; get in the alfalfa and use it properly in the rotation and we will never need fertilizers as long as this country lasts. I say the time to look after that is to-day. Let's get on to these things and use our good, old, common, horse sense, and use the legumes and the things nature has provided for the supplying of these nitrates, and we will have no need to use commercial fertilizers; and if we will grasp that very point, we will never be in the position the Eastern United States is in at the present time. My idea is let's get down to good, common sense farming to-day, and we will make more money out of it by growing legumes and alfalfa and returning the manure to the land—if you will grow crops on the farm and feed everything to the stock—sell your stock better, and then you actually return in the manure to the land 80% of every crop that you take off the land. No, the time for the depletion of the soil is going to be a long way off if we will take the thing in the right way. I say it, and I mean it; grain growing is simply soil robbing, and the quicker we can get away from it the better.

Mr. JENNINGS.—You are assuming that alfalfa will absolutely grow in the northwest?

Prof. ELLIOTT.—I am assuming that I am growing it. I am assuming that we are growing it on the demonstration farm, and when you come down there I

will show you 20 acres that we have been growing and cutting for the past two years, and growing a very magnificent crop on it this spring, and will cut it the second time this year. On the strength of that, I have seeded another 78 acres, and it is up 6 inches already.

I believe we need inoculation in this country. I know that Dr. S. Barclay and Giffin are getting a splendid crop this year. There is a gentleman at Dalroy who is also getting it firmly established and has been cutting it for two years. Mr. Fairfield, 100 miles to the south of us, has been growing it for eleven years, so I think that we are safe in saying that alfalfa will grow in this district. I am satisfied that the crop in Strathmore will grow in this district, and grow splendidly under irrigation, but we must inoculate, we must thoroughly prepare our soil before we plant the seed; you cannot come in on prairie sod with half prepared seed, and plant alfalfa and have it come out successfully. Here we happen to need inoculation, and men become discouraged if, with the first planting and no particular attention, it does not grow. I am as satisfied as I can be that we will have alfalfa growing by the thousands of acres in the east of Calgary under irrigation and down through Mr. Fairfield's country, perfectly satisfied of it.

MR. FAIRFIELD.—There are 6,000 acres of alfalfa in the Lethbridge district at the present time, I agree perfectly with Prof. Elliott that there is no question of alfalfa growing. Evidently in the Strathmore district, from what I know of conditions, it is quite possible that we may have to be a little more careful about the strain that we grow, we might perhaps have to use a more hardy strain. There is no question in my mind at all but what it will grow. The point that Prof. Elliott brought out about the importance of inoculation I don't think is appreciated fully enough by most of the farmers. The first alfalfa that I grew personally, in the Lethbridge district, I sowed ten years ago last April, so it is the 11th season for it, and that field is just as healthy as any field that we have got, but for three years it was barely alive, a scaly, yellow color, and would hardly grow at all, and finally by inoculation we got that into a healthy condition and the fields are so now. As near as we can estimate, there was about 2,500 acres of alfalfa shown in the Lethbridge district, including the country to the south.

MR. THRUPP.—I am doing almost exactly myself what Mr. Elliott suggests; I started growing alfalfa without inoculation, and I am trying it with inoculation. On the grain growing point, Mr. Elliott gives us a rotation in which he only grew grain crops once in ten years—how is Canada to keep up its reputation as the granary of the Empire—?

PROF. ELLIOTT.—Use alfalfa, two years grain, following with a third crop of peas, then another grain crop, following with the fourth year grain.

MR. AGUR.—I'd like to ask Mr. Fairfield the number of pounds of the alfalfa they use to seed?

MR. FAIRFIELD:—On irrigated land we find about 20 pounds of seed to the acre is the most the farmers use. The majority of farmers sow from 18 to 20 pounds and we irrigated the last thing in the fall, that prevents the necessity of irrigating for the first crop, then irrigate after each crop. The first crop is cut the last of June, and the ground is immediately irrigated. The second crop is cut about this time when it does not rain, and is irrigated right after that, and then the last

time it is irrigated is late in the fall, just before the water is turned out of the ditch. Some of the farmers are only making two cuttings; in that case the alfalfa is usually irrigated after the first cutting, and just before—the last thing in the fall—before the water is turned off.

MR. AGUR.—Are you generally able to get three cuttings?

MR. FAIRFIELD.—Yes, we have done. It is necessary, though, to cut right on time to get the three cuttings.

MR. AGUR.—What is your maximum yield, and your average yield?

MR. FAIRFIELD.—I can only give you actual figures from the results we have obtained on the Experimental farm for the last three years; our yields last year of alfalfa averaged just a shadow under six tons to the acre, from $5\frac{1}{2}$ tons to the acre, and the year before that it was about 5 tons of alfalfa, and it was the first year we had it with the three cuttings. And I may say that these yields on the Experimental farm are not any larger than the farmers are getting ordinarily.

MR. CRANDALL.—I'd like to ask Mr. Fairfield if he believes that we will ever be able to produce our own alfalfa seed in this country; that is one of the big drawbacks to the planting of alfalfa to any great extent is the expensive outlay for seed. At the price which we have to pay now, about 30c. a pound, 20 pounds would be \$6 per acre that we have got to put out in cash—then waiting; do you think we will ever be able to produce any seed in Alberta?

MR. FAIRFIELD.—I may say that I have not the exact figures but there were at least 2 or 3 tons of seed raised in the Lethbridge district along the A. R. & I. railway last year. I threshed it personally three different times, and had no difficulty in getting a fair crop of seed, only the yield was not high, yet at the present price of seed it was very favorable and I got about 100 pounds of seed to the acre. I don't think there will be any difficulty in raising this seed here, but just how profitable it will be from a commercial standpoint, I am not prepared to say, because I do not think we have had enough experience with it; it is necessary to grow it for seed to have it. Then, I am carrying on some tests on the Experimental farm now with planting the seed in rows on non-irrigated land with the idea of finding out whether it is possible to raise the seed commercially, and get our own seed to use.

MR. CRANDALL.—Might I ask if you consider the Grimm seed—any variety of alfalfa grown in California or in Utah—is the seed produced there? Will these varieties produce satisfactory results as far north as this?

MR. FAIRFIELD.—I hardly like to answer that question very definitely because I can only give you my personal opinion; if you absolutely know that this is a seed that has been grown in California, it might perhaps, be just as good; personally, I prefer to have the seed come from Minnesota or Wisconsin or grown right here.

MR. CRANDALL.—Might I ask if the report which I have heard from a number of people, that of the quantity of Grimm seed that is sold for Grimm seed, there is not 10% really genuine Grimm seed, and does not that account, to a certain extent, for the failure on the part of growing alfalfa?

MR. FAIRFIELD.—I think there is no doubt that is one of the reasons, if it is true—a possibility—that in certain parts of this province we have to use hardy

alfalfa—then the point that you make must be true, because we have pretty definite knowledge that there is far more Grimm seed put on the market than is actually grown in the district where the Grimm seed originated.

RESOLUTION No. 2.

CHAIRMAN.—Resolution No. 2.

MR. PETERSON.—Before this resolution was submitted to the Board I had myself a conversation with Mr. Campbell, and asked him as to the steps that would be taken by the Department of the Interior in looking after the fire guarding of the land that will be withdrawn from Rocky Mountain park. Mr. Campbell told me that matter was apparently very well in hand, but he also said there would be no harm in submitting the resolution to the meeting. I won't enter into the reasons for this convention passing a resolution calling upon the government to take care of the forests. Everybody here knows that we have been over the ground over and over again, and the resolution does not seem to require any further explanation, I merely put it in its present form:—

“Whereas, the conservation of the forests on the east slope of the Rocky Mountains, so as to promote the gradual melting of the snow and equalization of the run-off of storm waters, is one of the most important factors in the successful irrigation development of Southern Alberta; and whereas, an Order in Council has recently been passed greatly restricting the area of the Rocky Mountain Park, and thus withdrawing from the area now excluded the close fire guarding and general conservation, which has, in the past, been devoted to the said Park;

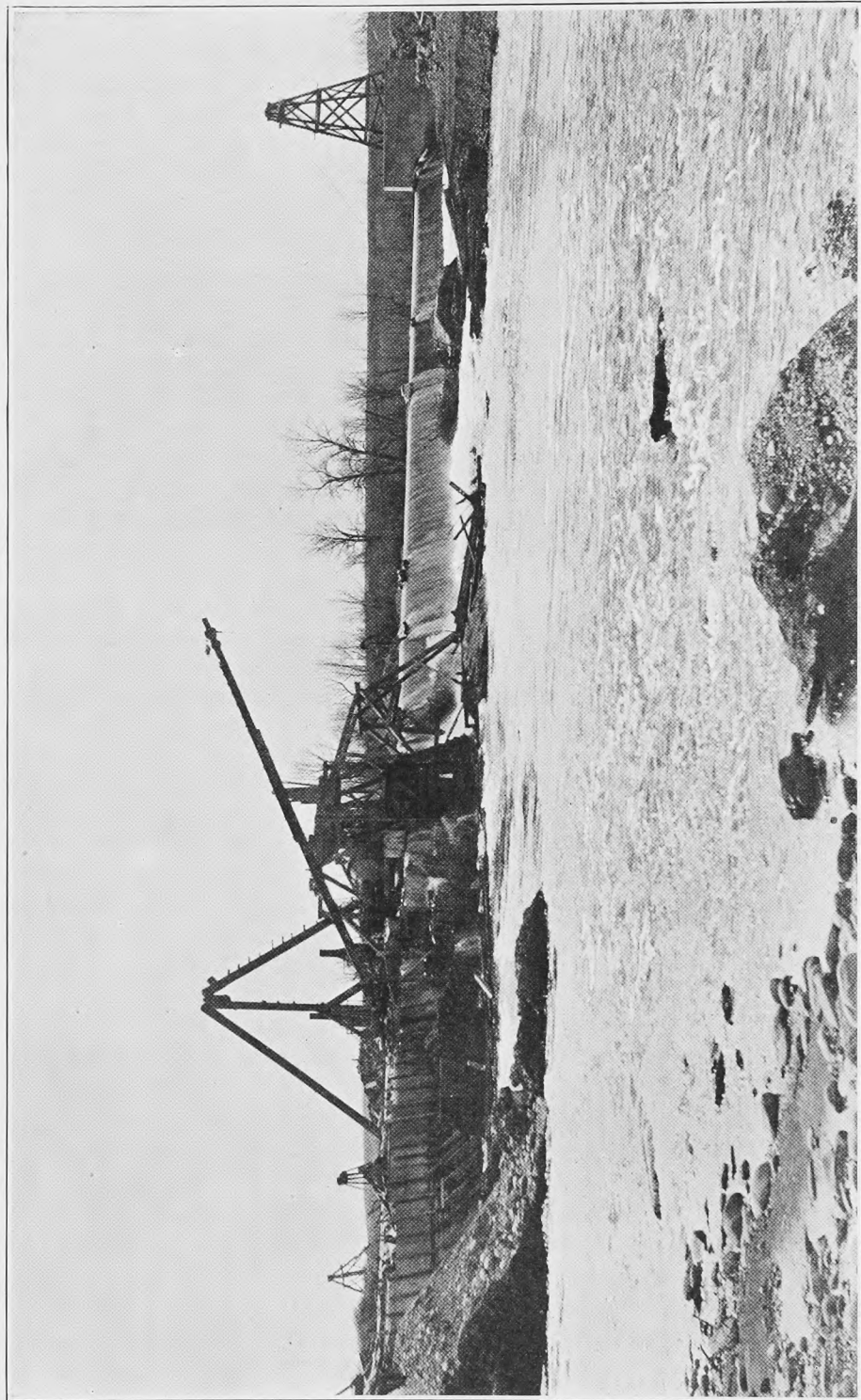
Therefore, be it resolved that the Honorable Minister of the Interior be requested either to extend the boundaries of the Rocky Mountain Park to cover the original area set apart, or to greatly augment the fire guardian service now in successful operation in the Forest reserves in the Rocky Mountains, in order to adequately cover the area now excluded from the jurisdiction of the Parks Administration.”

I do not know whether it is necessary to get a seconder—I ask some gentleman to second the Resolution. Seconded by Mr. R. S. Stockton.

CHAIRMAN.—I think I will have to ask the privilege of speaking to this resolution in order that certain matters in connection with it may be clear to the convention.

I am not sure of the exact year, but back in the '90's—the Rocky Mountain Park was extended, and it covers an area of between 2 and 3 million acres along the main line of the Canadian Pacific railway just west of us. For a considerable time that was the only reservation of lands along the eastern slope of the Rocky Mountains; it was the only tract that was being looked after and guarded from fire, and guarded as a game preserve.

Recently the situation has changed. A park a little larger than the one on the main line of the C.P.R., was set apart two or three years ago on the main line



Southern Alberta Land Co.'s project:—Bow River Dam (almost completed).

of the Grand Trunk Pacific—I am speaking of the eastern slope of the Rocky Mountains which is under Dominion jurisdiction—and a small park was set apart at the International boundary around the Waterton lakes. Until last year these were the only reserves that were made along the eastern slope of the Rocky Mountains. Last year however it was finally decided by the government that the whole eastern slope of the Rocky Mountains should be made a Forest Reserve, and an Order in Council was passed accordingly, making the whole eastern slope from the International boundary north until it met the boundary of British Columbia—the whole eastern slope of the Rocky Mountains—a forest reserve. During last year, we had two parties working from the International boundary, and they got as far north as the North Saskatchewan river—to determine just exactly where that boundary should be. It was made provisional by the Order in Council, and when we came to take it up in parliament we wished to have a line that would be final, and that would be adopted on some recognized principle; we went carefully into the matter before the party started out, and we came to the conclusion that a line of about 4,000 feet in altitude above the sea would be about the proper altitude at which to draw the eastern boundary of that forest reserve. During the recent session that reserve was set apart by an Act of parliament covering that strip from the International boundary to the boundary of British Columbia on the north, crossing the Bow river, the North Saskatchewan and the Athabasca right to the head waters of the Peace river, so that all that is within a forest reserve. But the Act was made a Forest Reserve and Park Act, and in that Act provision was made that inside of any forest reserve a park could be established by Order in Council—it did away with the parks that were in existence before the Act was passed, not with the idea of wiping them out altogether, but with the idea of re-establishing them, or re-establishing them partially, under the authority of the Forest Reserves and Parks Act. When the Forest Reserves Act came into force, the whole eastern slope became a forest reserve; then by Order in Council there were certain tracts set apart as parks—the Rocky Mountain Park had existed before along the main line of the C.P.R.—it was reduced in area by Order in Council, and the park along the Grand Trunk Pacific was reduced in area by Order in Council.

Now, I am not prepared to say that that reduction in area was altogether the best method to make—I think perhaps there might have been a reduction made which was not quite as extensive as the reduction that was made, and it would have served the purpose perhaps better than the present condition; but I wish to point out in that connection that in so far as the protection of the watershed from fire is concerned, and the preservation of the timber, that steps will be taken with it as a forest reserve to protect it in every way possible. We have done considerable already this year and we will keep on perfecting the system. Just as efficient steps will be taken to conserve the timber on these lands which are left outside the park as were taken before; so that so far as the question of protection from fire is concerned the fact of these lands not being included in the park is perhaps not a matter of the highest moment.

There is an argument for including a larger area in the park from the question of the protection of the game. We have had an organization in the last couple

of years in the park which has, I think, done fairly successful work in the protection of the game there; and there are certain parts which have been excluded from the park which it probably might have been better to have retained in the park. Of course under the Forest Reserves Act, even with this land as a forest reserve not included in the park by Order in Council, it may still be protected as a game preserve; but we have felt it was not an advisable thing to set apart the whole eastern slope of the Rocky Mountains as a game preserve and shut out the hunter everywhere from the vast area. It was considered it would be better to have selected areas protected and give the game a chance to reproduce, and leave the opportunity to the hunter to obtain game outside of such areas and still prevent the entire extinction of the game. That is the situation in connection with this Rocky Mountains Park. I hope the explanation is clear to the convention, and I thought it was probably well that, knowing the whole circumstances of the case, I should make at least that much of an explanation to the convention. Are you ready for the resolution? The resolution is carried.

CHAIRMAN.—The next item on the programme is a paper by Mr. R. S. Stockton, Superintendent of Maintenance and Operation for the Canadian Pacific railway Irrigation Department.

THE OPERATION OF IRRIGATION SYSTEMS.

ROBERT S. STOCKTON.

It has been my fortune to be connected with the operation of a number of large irrigation systems during their initial stages. The operation of a newly constructed irrigation project presents many difficulties outside of the general problem of the proper organization and policy covering the operation and maintenance work on an irrigation project. It is my intention to review some of these matters which are of interest as well as outline some fundamental principles governing the operation of an irrigation project.

During the first few years with a newly built system of canals and works designed to deliver water for the irrigation of a certain amount of land, the operating engineer must test out the sufficiency of the works, and usually leads a busy life. Canal banks and dams, which no one would have predicted unsafe may, when saturated with water, develop slides or seepage requiring many anxious days and nights. After a time the settlement may cease and no further trouble occur, or, conditions may grow worse and extensive reconstruction be necessary. Again, certain structures will be found too small or inadequate to meet the conditions, and all sorts of expedients must be resorted to until the defect can be remedied. This does not necessarily mean that the constructing engineer has made a mistake, but simply that he is not omnipotent, and cannot, without an unjustifiable expenditure, provide for every possible contingency. In fact, as a business proposition, it is often much cheaper to install temporary works until use has demonstrated the best type and size of structure.

A pertinent illustration, which will make this more clear, is the analogy between operating a ditch and a railroad. A new railroad is handed to the operating department who must try and furnish continuous service and at the same time

take up the settlement in the fills, clean out the slides, make additional provision for cross drainage, etc, and eventually replace temporary structures with permanent ones. These troubles make a new railroad more difficult to operate;—in the same way a new ditch may have all these things happen and more. If the grade is a little too steep, the water will erode the ditch bank, or burrowing animals may start a break. A break in the canal bank affects the operating force about like a train off the track, and the cars on fire would the railroad employees. The analogy may be carried still further:—The train service must be governed rigidly by despatchers, in order that people and goods shall be delivered on time to the proper destination. In a like manner, the water in a canal system must be run on schedule, and be delivered to the water users at a stipulated rate of flow. It will be conceded then that the operation and maintenance of a large irrigation project requires a staff of men technically skilful and experienced in the handling of water, or to pursue our line of thought, it is just as necessary to have experienced irrigation engineers and water masters to run the irrigation system as it is to have experienced trainmen on the railroad, as there is the same special knowledge required.

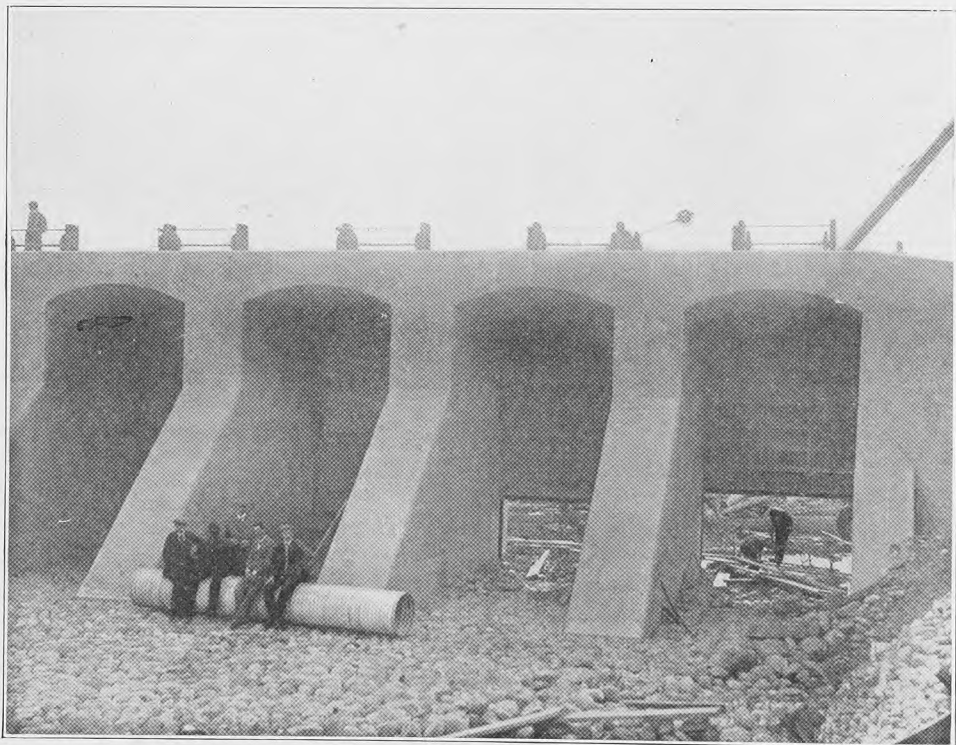
The organization found most efficient for the handling of an irrigation system, consists of a superintendent or manager supported by an engineering force capable of handling the betterment work and general administration, and a clerical force sufficient for the purchasing, accounting, and cost keeping. The water is handled by ditchriders, each one having a certain district with which he becomes perfectly familiar, and must have an intimate knowledge of both the ditches and water users in his territory. The ditchriders report to the water masters, who should be old experienced ditch men familiar with the handling of water, directing repair work, putting in structures and last but not least, having a tactful personality and a good understanding of irrigation farming.

The water master is the most important link in the chain, for if he is of the right type, inexperienced ditchriders can be used with fair results. The size of the water master's district varies with local conditions, but it is usually of such size that he can drive to the extremity of the district and back to head quarters in a day. The large irrigation development in the west during the last few years, has created a demand for experienced ditch men, and good salaries must be paid.

After competent men, one of the most essential things for the operation of the project is a good telephone system connecting the head works and most important points. This is just as essential as telegraph or telephone service is to the train despatcher. The water master must know how much water is running and where every foot goes to. The ideal arrangement consists in having a company telephone system connecting the water masters' headquarters, ditchriders' headquarters, and certain critical points on the canals. This system should be free from private business and used exclusively by the operation force. As an additional safeguard, it is very desirable to have headquarters and the water masters' houses connected with any commercial or government telephone service in the district so as to allow of communication in case of trouble with the ditch company's line, also so as to facilitate general business with merchants and others, and finally to allow of quick connection with the water users who are thus in a

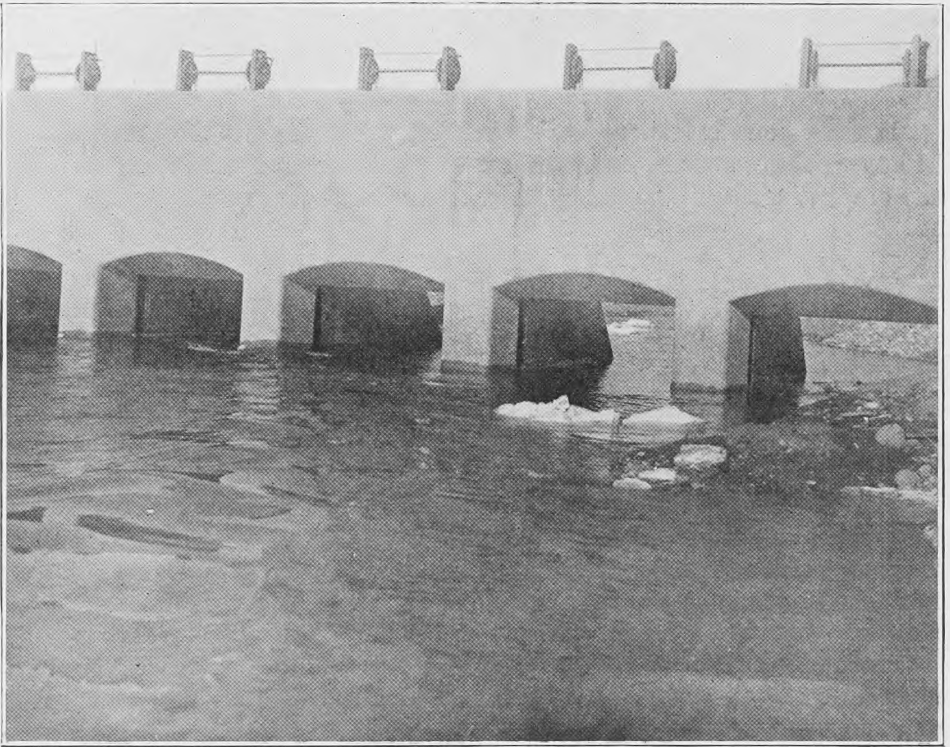
position to make known their wants with the least delay and to promptly notify the water master in case of threatened breaks or trouble at some point that otherwise might not be discovered in time to prevent damage. A double telephone service coupled with the co-operation of the farmers and an efficient operation force are the essentials for safe operation. To emphasize the importance of these matters to both the irrigation company and the farmers of the district take as an example the following:

Suppose that under a certain ditch there are 20,000 acres in crop ready for irrigation, and that a break occurs, requiring ten days to repair. This might easily damage a grain crop to the extent of 5 or 10 bushels per acre;—or we will assume for the moment the loss amounts to \$5 per acre on the crops affected. Under these conditions the farmers of the district lose \$100,000 and the ditch company loses a tidy sum, hence it pays to keep up as good a telephone service as possible with connections to as many points as possible. The usefulness of the ditch company's telephone system can be largely increased by installing telephone instruments in booths at points where the line crosses the canals between stations. These instruments can be switched on by the ditchrider when he passes and reports be received and instructions given saving much time. This saving, as explained above, may, in time of emergency, be very important. As the extra telephones when not in use are switched off the line, nearly double the number of instruments can be handled on the same line without overweighting it.



Southern Alberta Land Co.'s project:—Intake of main canal from the down stream side.

A road for the operation and maintenance force along the main canals and laterals is of great importance for several reasons: it facilitates the economical conduct of the work, it allows the ditch rider to follow the bank in a cart or buggy and carry tools that would be held behind if he had to go on horseback; he is thus more efficient, and finally various employees follow the ditch road, which means that the condition of the water and banks is subject to more frequent inspection with consequent greater safety. The operating road is a feature that is often overlooked by the constructing engineers; it frequently happens that by extending a culvert a few feet, or making some change in the disposal of waste material, or by increasing the right-of-way slightly, a road can be had for a fraction of the expense that would be necessary later.



Southern Alberta Land Co.'s project:—Bow River Dam—Intake of main canal.

On the larger irrigation projects, and as water becomes more valuable, it is increasingly necessary to have systematic records covering the discharge of the main canals and laterals, the water lost by seepage and evaporation and the water wasted back into the river. It is still more important to determine the approximate amount of water delivered to each tract of land. It is desirable to have in addition, the acreage in each crop and the yield per acre for the individual water users. With these records, the ditch company is in a position to introduce important economies in handling the water, reduce the losses, and can meet the complaints

of the water users with the facts as to the quantity of water delivered between given dates. The exact form in which this information is recorded will vary, but the basis will always be the daily gauge readings, measurements and changes in gates recorded by the ditchrider, and submitted in his reports and diary. The measurement of water to the farmer should be by weirs where possible. The larger canals are usually measured by rating flume and current meter, or at some structure.

The operating force should be supplied with maps showing the land ownership, irrigable and non-irrigable acreage, and location of canals and structures. This enables accurate reports to be rendered as to field conditions, and allows of systematic records of work done, change of ownership, etc. Such maps are a necessary aid to the management in considering the various problems in connection with the operation, maintenance, water duty, crop returns, collections of water rents, charges, etc. These maps are usually supplemented by card catalogues of the water users.

In the various irrigation districts in Western Canada and the United States, the larger policies and the irrigation law is laying more and more stress on a high duty of water and its utilization by storage, and proper use over the largest possible area.

One of the most important duties of the operating engineer is in working out a policy and system of delivering water that shall ensure to the water user adequate returns, while making the largest possible use of the water supply. This matter has worked out in practically every developed irrigation district to the plan of rotation in the delivery of water. This policy gives to each user a certain amount of water for a definite period. The amount of water thus delivered can be measured, and the charge based on the quantity delivered if desired. Usually a flat charge is made for water not to exceed a given duty of, say, 2 to 3 acre feet per acre for the season. In many districts the water available depends on complicated priorities and storage reservoirs, and practically all water agreements provide for prorating the supply in case of shortage. The doctrine that water cannot be appropriated unless put to beneficial use is applied so that if the water user is not ready, or fails to take care of his supply when it is delivered to him, then the water is promptly used elsewhere. The rotation should always be arranged to give the water user an irrigating head suited to his land and conditions but limiting the time during which he may use the water to conform to the water pro rated to him under his agreement with the ditch company, and in proportion to the total water supply. The rotation of water can be carried on successfully by association of water users covering the land on each main lateral, or the ditch company may be empowered under their agreement with the consumer to rotate the water. In the first case, the ditch company delivers water wholesale to the lateral ditches, and in the second case delivers water retail to the individual. The essential point is that some one is authorized to make an arbitrary division of water and time, subject only to appeal to the superintendent or board of directors. Measurement of the water to each user obviates most of the trouble resulting from the division of the supply.

A system of diversified farming is necessary in order to obtain the full benefit of the water right and ensure a high return from the land. A consideration of the rotation of the water supply brings up the most difficult and important duty of the operating force, [*i.e.*] to treat the farmer under the ditch in such an honest, fair and courteous way, that the rules and regulations of the ditch company may be enforced rigorously without detriment to legitimate farm requirements, and without offence to fair minded men. Those who have followed the points brought out in this paper will concede the importance of having rules and regulations. As successful service is built up by means of a harmonious well-trained organization following a detailed and accurate system, of which the water user is an essential part. It has been found a great help in administration of a large system to have these rules and regulations printed so that all parties may understand fully the policy of the company and the reasons for its enforcement. A good example of such rules and regulations may be found in the pamphlet recently issued by the Canadian Pacific Railway Irrigation department governing the delivery of water and related matters on the Western section of the irrigation block. One of the largest problems on some of the newer irrigation projects colonized by people entirely ignorant of irrigation farming, is the education of such people to an appreciation of the benefits of irrigation and a knowledge of the methods of irrigation.

The operating force is and should be a big factor in this campaign of education, but it is desired in this paper to merely call attention to this fact without going into the many questions that would arise were a discussion of this phase of the subject attempted.

In conclusion, it may be said that the operation of irrigation systems, and the policies connected therewith, is receiving much attention throughout the west, and laws and customs are growing to meet the conditions. The United States Reclamation Service as well as many large irrigation companies in both Canada and the United States are working on the problem of the best utilization of water for irrigation and power development.

MR. AGUR.—I would like to ask Mr. Stockton what you ordinarily pay a good man—a ditchrider—and how many months in the year you pay him?

MR. STOCKTON.—The policy in regard to ditchriders varies tremendously in the different districts where I have been. In the Western section of the irrigation block at the present time, ditchriders are paid \$65 a month and kept on the year around, in a furnished house and land, and some privileges. In the States they are mostly paid at a rate varying from \$75 to \$90 per month during the operating season, which varies according to the conditions, somewhere from 6 to 9 months, and the ditchrider furnishes his own outfit, his own horse.

CHAIRMAN.—Have you found much difficulty in working up the water users' associations, difficulty in having men come into them?

MR. STOCKTON.—The water users' associations proposed on the irrigation block—for the operation of their own laterals—has been proposed to them only in our regulations this year, and nothing has been done up to the present time. In the Reclamation Service work, most of the projects were organized before

the government started to build an irrigation project and have a formal organization, but where that is not done the matter progresses very slowly.

CHAIRMAN.—Is the formation of the water users' association always voluntary or is it covered by law?

MR. STOCKTON.—In the Reclamation Service it is covered by law; they assume a legal position in combining their laws as subject to the operation of the Irrigation Act, and in that way the government does not deal with the individual until the collection of the water rights is started; on the first dealing, the secretary of the Interior makes an agreement with the water users' association in which the laws are completed subject to the charges and terms of the Irrigation Act, and these water users' associations are not for the purpose of distributing water but simply for the legal position.

Now, we have taken in the northern district of the Reclamation Service about the same position as we have taken here. We have given the people there the right to organize and operate their own system with certain privileges to pay them for taking that trouble, and at first the law or the regulations of the Secretary of the Interior did not permit a reduction in the charge but later on that was amended; however little has been done in the Reclamation Service towards operating the main canal as a wholesaler of water but they are working towards that policy; they consider that a desirable policy, and the district in which that has been worked out to the most desirable end is probably in Northern Colorado where that is the ordinary system of delivering the water. Most of the ditch companies there deliver their water to the head gates of certain laterals, it is there received by the ditch rider or the representative of the farmers' association, and the latter associations are in many cases legally formed exactly in the same manner as the main ditch company, with a board of directors who meet and elect a ditch-rider, who is empowered for that association, to operate the ditch and deliver the water.

CHAIRMAN.—The powers of the association are a matter of agreement, not a matter of law?

MR. STOCKTON.—They may be incorporated or not, as they choose.

CHAIRMAN.—The point I was trying to get at was, supposing there were a dozen people on a particular ditch, and the association wanted to be formed, and there were two who wanted to stay out, there is no legal procedure is there, in any of the states, whereby those two would be forced into it—it would be a matter of agreement between them, to form such an association?

MR. STOCKTON.—Well, I am not prepared to answer that directly, except in the Colorado district they have the matter pretty well in their hands, and you cannot transfer land there (I don't believe) without committing the purchaser to that same agreement; and it is not a matter of choice there, although I don't know just what the legal position of the thing would be.

CHAIRMAN.—That has been a matter of education, they have grown into it?

MR. STOCKTON.—Yes, irrigation was started there just in a small way with the first settlers, and it has grown up to its present proportions.

MR. JENNINGS.—Do they take over the maintenance of the ditches, these associations?

Mr. STOCKTON.—Yes.

Mr. JENNINGS.—And repair the structures?

Mr. STOCKTON.—Yes; although of course you find every possible condition; in different irrigation districts you find different practices and different agreements, and different ways of doing things, but that is the general way.

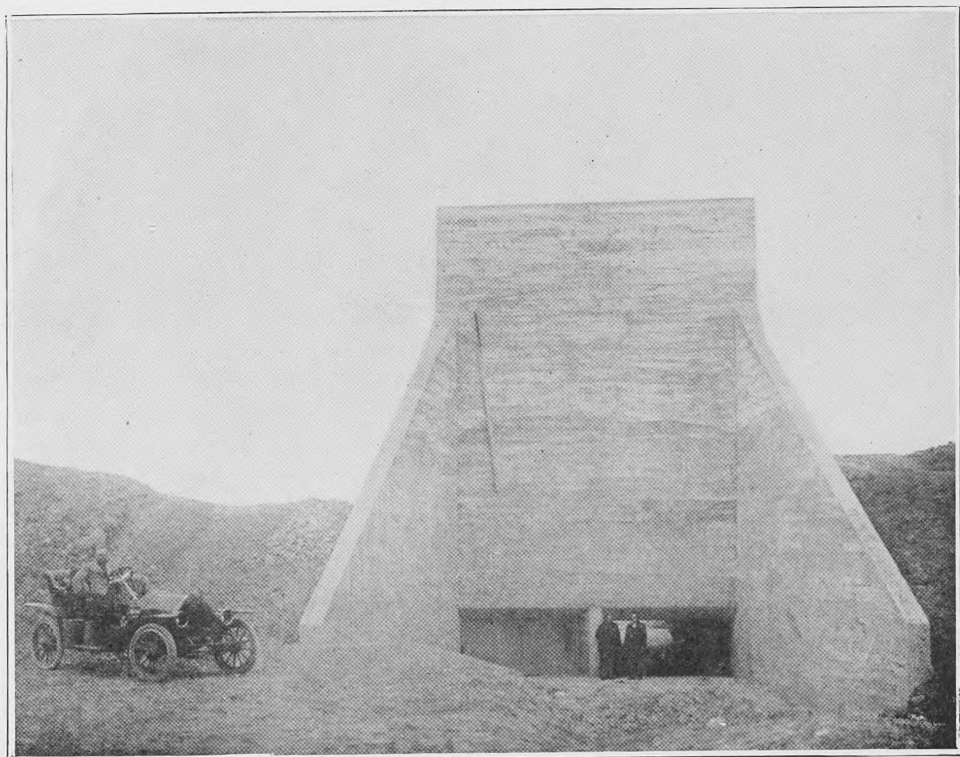
Mr. JENNINGS.—You mentioned about roads on your canals for access to ditch riders and water masters; would you recommend those on all your laterals and secondary canals as well, or merely recommend them on the secondary canals?

Mr. STOCKTON.—Of course the larger the ditch the more important they are, and there is always some point where in a practical way you would not care for a formal road; it would be difficult to say offhand just what that point would be. On any ditch that is going to require much repair work or daily patrol, a road is of value; if it does not take too much land.

Mr. JENNINGS.—You would not recommend it on laterals?

Mr. STOCKTON.—Yed, I'd recommend it on laterals unless they are very small.

CHAIRMAN.—As no person is prepared to discuss this paper further we will take up the next item on the programme, which is resolution No. 6.



Southern Alberta Land Co.'s project:—Outlet from reservoir from above (dam uncompleted).

RESOLUTION No. 6.

Mr. CORDY.—In moving the resolution which has been placed in my hands, it won't be necessary for me to take up very much of your time. I think you will agree that the resolution speaks pretty well for itself. At the same time, there are a few points I'd like to touch on. I am speaking as a resident of British Columbia in speaking on these points, and I hope the seconder will be somebody in Alberta so that he can touch on these points from the view of the residents in Alberta.



Southern Alberta Land Co.'s project:—Outlet from reservoir from below. (dam uncompleted).

One of the main points, I think, in this resolution, is that as at present—as the water is conserved at present, it is conserved by companies or private individuals and the result of this is that the creeks—I can put my finger on half a dozen points in B.C., in which this is the case—the creeks are all recorded up to the last drop of water by companies or by individuals; that is, the old time individuals and the companies have got all the records on the creeks, and in many cases there are from 2,000 to 5,000 or 6,000 acres outside of that which would come in. You have in good, arable land, bringing produce into the province, and bringing an income to the Treasury through taxes and in other ways—there are from 2,000 to 5,000 or 10,000 acres lying outside of this which cannot get water from the creek, and the only way they can get it is by dams and reservoirs. These men cannot put in a large dam sufficient to supply the water, for it would be too much expense for a single man—for 320 acres—to put in a dam and carry the water the distance he

would require it. So that I think it would be very beneficial if the government would conserve the water, build these dams and put up reservoirs, and conserve the water, for the benefit of the farmers; to take the whole thing over; it could not be done without their taking the whole thing over. I have spoken to several of the owners and prominent men in big irrigation sections, and they all quite agree it would be far better, and they are all quite agreeable to have the thing taken over by the government.

Another point that is mentioned in the resolution is that it would increase the security of bond holders. In Summerland we have a municipality who own all of the water records in the place; it is a pretty good guarantee of permanency a municipality holding it, just the same as it is a good guarantee of permanency, a big body like the C.P.R., holding the records. I think it would be a far better guarantee of permanency of water supply if the main reservoirs and dams were operated and kept up by the government, and in such case any municipality which has a big water system like that, and wants to place debenture bonds on the market, they would be able to get a far better price, as the security would be greatly enhanced by the government holding these dams and reservoirs. I will read the resolution:

“Whereas, the conservation of water for irrigation purposes by companies and individuals as at present carried out, does not admit of the whole available area in each district being brought under cultivation; and whereas, the conservation of water by the government would be the means of developing such areas to the fullest extent, assure absolute permanency of supply and materially increase the security to bondholders.

“Be it resolved that the governments in which such districts exist be urgently requested to give the matter their serious consideration, and to put such system into operation at the earliest possible date.”

Resolution seconded by Mr. Peterson.

CHAIRMAN.—This motion has been moved and seconded and is now open for discussion; it is an important resolution, probably one of the most important that the convention will consider, and we would like to hear pretty generally from the members of the convention in regard to it. I am going to ask the liberty of speaking to it myself a little later on. I would like to have the convention discuss it somewhat fully.

Mr. CRANDALL.—I think those who are familiar with the irrigation systems of the States which have been organized and carried on before the Reclamation Act, or before the United States through its Reclamation Act took over the handling of the water from many of the principal streams, will understand your resolution most seriously, and the importance of this present resolution.

I happen to have spent a good share of my life in the state of California where irrigation is carried on to a very large extent; those of you who have in any way studied the irrigation systems of California know full well that nearly all of the systems carried on in California are carried on under private or corporation management. The water in the streams of California to-day is over-recorded, perhaps

anywhere from two to ten times the volume of water which flows in the various streams of California. If you should visit some of the irrigation systems in California and see the waste of water that is incident to the handling of it in an individual way, or handling it for irrigating certain areas, where the riparian rights to the water have been taken out by an individual or corporation for certain lands and have been limited to these lands, you would then understand the greater importance of the resolution which is before the house.

I, of my certain knowledge, being quite familiar with the irrigation problems of California, know of many instances where perhaps from two to ten times the duty of water could be had if it was handled under government control or government management, than it can under these present individual ways of handling.

I certainly am very much in favor of the resolution which is taken up, and especially at this time before many of the streams have been actually utilized it will make it very much more easily handled than it would after an irrigation project, even in a small way, has been undertaken and certain arbitrary paths and flumes constructed by individual or corporation organization.

I certainly am very much in favor of the resolution.

Mr. JENNINGS.—I am very strongly in favor of it. I am of the opinion that the water from the reservoir storage is better for irrigation than the regular river water; and also from the fact that the storage would be able to turn the water into other creeks and streams which for a good part of the year usually go dry, and for which problems come up every day where it is impossible to buy out any more rights on certain streams, it often holds up the development of the small farmer's schemes, also the water required for domestic purposes, and I think government reservoirs would be very valuable for this purpose.

Mr. DAWSON.—I can say nothing more than support the views that have been expressed by the other gentlemen. Speaking for this province, it is really a matter of conservation, and the government has been besieged or requested by most of these resolutions at all of the other conventions which I have attended, and unless some more action is taken in the future regarding these resolutions than has been in the past, it would seem as if nothing would come from the discussion. I think it is a very important resolution, and I do not see but what it should have the support of every delegate to this convention.

Mr. GRAHAM.—I think it is a very important resolution, the most important one I see on the list. It means this, that unless the government takes hold of this water storage question and distributes the water to the best advantage, it means no water for nearly half the land that is available for agricultural purposes in British Columbia, particularly in our dry belt around Kamloops—there we have streams—there is any amount of water going to waste every year, and there are good places to store the water, but as has been pointed out here by some of the other speakers, the companies and private people have recorded more than any natural flow will furnish in the year, but with the government taking hold of it, it is very necessary so that each one will get his right share—and storing water—there would be enough water to irrigate all the land on the railway. Now, though I presume there are some government officials here, this question cannot be brought any too much to their attention—I think it is a question of the Dominion govern-

ment and also of the Provincial government, and because we have a railroad belt of 40 miles wide right through British Columbia that takes in practically all the dry belt, and we have not one-tenth of the land in a position to get water at the present day; now, if both governments saw the point as we do in that district—I don't presume you see it as much as we do—I have had nine or ten years of farming there near Kamloops in the dry belt, and I claim we cannot grow anything without water. Here you are different. You can grow a pretty good crop here, and it appears to me you have not much need of irrigation right now. With us it is water or no crop, and it is a serious question with us. I think the government ought to be impressed with the very important fact that it is time they took some action and protected the people, and further, bringing in a great number of acres that will never be brought in unless they do.

CHAIRMAN.—If the convention does not want to discuss the question further I think I will have to inflict myself on them for a few minutes talking on the subject of the resolution. This matter has been discussed on previous occasions, but I am not sure that it came to such an absolute decision in the resolutions previously passed—passed by previous conventions—as the conclusion that would be reached if this resolution were passed. I remember very well at the convention that was held in Vernon, British Columbia, a year or two ago, that this question was discussed. Being one of the government officials to whom the gentleman referred, I look at it from the point of view of the department, and I would like to consider the question in the way it would work out in connection with the questions that might arise in the working out of a scheme such as suggested here.

Now, in the first place, there is no distinction made between the smaller and the larger streams and the smaller and the larger works. It almost seems to me (although I do not advance it as a conclusive argument or statement at all) it almost seems to me, in very small streams, that the users all might get together and arrange for the construction themselves. I quite understand, however, that that does not meet the point that there are persons who are not users who want to get the use of water and who have not the chance to come in because those who are users and holders of water rights are not willing to make any arrangement, and I can quite see where there is necessity possibly for the government coming in as an intervening party.

There is another thing in regard to how the cost of the works is to be met. Now, Mr. Peterson has referred to the Reclamation Service and the costly works that had to be erected by the Reclamation Service in connection with their projects. It is true that these works were very expensive works but the government has in all cases assessed the costs of the works on the lands to be benefitted, and the whole basis of the Reclamation fund was that it was to be returned to the Treasury by the payments made from the lands to be benefitted.

Now, I do not know whether that is the line that is in the minds of the movers and supporters of the resolution, but it is of course, a question that would arise and would have to be worked out by the government undertaking works of that kind, how the cost was to be met and provided for. Is the proposal put by this resolution that the government should construct the works and that they should not count on getting back the cost of construction? If so, the proposition is a

different proposition from that of the Reclamation fund, or that which the Reclamation Service had to work out. Another thing, in regard to the rights that are already granted against the stream; if the idea is that the cost of the works should be assessed against the lands to be benefitted, what is the proposal? Is the government to wait until the people who already have rights and have lands irrigated from the waters of the stream will agree to such an arrangement, or is the proposal that the government should step right in and attempt to force them to an arrangement of the kind? I don't know how far the powers of the government will go in attempting to do a thing of that kind. If it could not be done and the government were to construct the works, it would mean of course that the government would have to bear the whole cost of construction practically. There are points like that that would have to be worked out in connection with any scheme of this kind that the government might undertake.

Now, I hope that the convention will not think that I am attempting to argue against the idea that is contained in this resolution. I think that it is quite clear that when the waters of a stream become practically all taken up to their natural flow, the time has come when storage must be undertaken, and I can see very clearly that in many ways, the government could undertake that storage much better than an individual, and much better than a company. But there are these other points to be considered in the working out of such a scheme, and I would ask that this convention in addition to suggesting that it would like the government to take up the scheme, would discuss some of these ways of working out the project so that when the government officials get up against it, they will have some idea of what is in the minds of the people who are interested in irrigation, and the lines on which a policy should be worked out.

MR. THRUPP.—I think that the movers of this resolution seem to think that this matter is very much more simple than it really is. It is an extremely complicated thing, and there are a great many legal difficulties in it, and personally, I am not very convinced that it would be desirable for the government to come in in every case, although I admit freely there are some instances where it is distinctly desirable. But there is so much to be threshed out in the matter of agreements between owners, and the method of getting rid of the people who object and who have rights, had rights for many years, that I confess I do not see how this resolution is going to do much good. I think it is going to put the government up against a very great difficulty, without helping to get to the matter of it, I'd much rather see the movers of this resolution amend it themselves and put it in a more tentative shape, and until it is put in that shape, I confess, I would rather vote against it.

MR. PETERSON.—As seconder of the resolution, I may say that the government never runs up against any difficulties from a convention like this; it is a resolution, and if the government does not want to deal with it they simply throw the whole thing out, and that ends it, pigeon-hole it, and that ends it.

CHAIRMAN.—I was considering the question of it not being pigeon-holed.

MR. PETERSON.—All we can do as a convention, is to bring certain principles we believe in to the attention of the government; they have their staff, their large civil service and the difficulties in connection with it are found out by men that

are trained to report upon questions of that sort. Now, the comparison between the United States Reclamation Service and the principle underlying the resolution here is not, perhaps, quite fair. We know that streams in Alberta are now recorded to the hilt, therefore any movement towards conservation of water would naturally be the creation of more water for more people. It might be a reasonable proposal that if surveys were made where these reservoir sites are, the government might outline some plan whereby private enterprise could come to them and say "I want a water right of so many cubic feet on the Bow river" or the Elbow river, as the case may be "I am prepared to go a certain way towards either paying for the water or paying the cost of construction;" there are many ways in which it could be done, furthermore. Failing all other means of getting the money back, there is always this little point to be considered, that it is not a principle in government business generally adhered to, that because a certain section benefits by certain public work, that the government must naturally get that money back. Why should they? A bridge is built, it does not serve all the Dominion of Canada, a wharf is built, yet the government does not say to the farmers, they shall give that money back—failing all other means, there is always that easy way of dealing with it. I am not suggesting that should be acted on right—away, notwithstanding, it is a subject for thought.

MR. CORDY.—Touching the question of cost, I think it should be taken into consideration that it would greatly enhance the value of the lands which were brought under irrigation through these dams and reservoirs. Land that is now worth in B. C. \$10 without water, would be worth \$150 to \$200 with water. I have 300 acres there that I would be glad to pay a tax of \$2.50 an acre on. If they will put water on that land and charge me \$2.50 per annum I'd gladly pay it, because if I got up against it and could not pay it, I could sell that land cheap for \$75 an acre, and there are hundreds of other men in the same position. As to the matter of demanding that the government must get the money back. There is no doubt they will be able to do so. It would be,—as Mr. Peterson says,—a benefit to the fruit growers, who are the greatest benefit to the province of British Columbia.

CHAIRMAN.—Referring to the Reclamation Service and what they are doing, the Reclamation fund is not a benovolent fund, and where the government put any improvements they are getting it back out of the land benefitted, so that if you draw an analogy between any action that may be taken by the Canadian government and the action that has been taken by the government of the United States in connection with the Reclamation fund, it follows that the cost of the works should be taken from the lands benefitted.

MR. PETERSON.—Water enhances the value of the land; no matter how it is created or stored, it will always benefit the land.

MR. GRAHAM.—I think if you get the government under the impression that they have to bear the cost of this work and not get it back from the lands benefitted by it, we will never get it, because there is only one per cent of the Dominion that would be benefitted by it; of course the others, or the great majority, would be against it. It is quite right that the lands benefitted should pay for it, why not? It makes the lands valuable, land without water is worth nothing; it is just the same as dykeing lands, the provincial government has helped the dykeing

question, they did it in that way, the land benefitted by the dykeing is visited by the engineer showing to what proportion they are benefitted and taxed accordingly, and they pay it back,—it is quite right; I naturally expect anybody who would be benefitted by it would be too glad to pay their share—certainly the land benefitted should pay the costs.

MR. W. P. MORRISON.—I have not very much to say. I think there is one thing that you have lost sight of in regard to these records that have already been recorded against a good many streams in British Columbia. There is one stream that I know of in particular where there are some 10 or 15 records for irrigation on this creek, I should think about 4 of them will take all the water that runs down it, that is in the months of July, August and September, but in the months of June and May and part of July there are hundreds of millions of gallons of water going to waste, running away down the creek, and I have been informed by pretty good authority on this particular creek, that with the expenditure of a few thousand dollars there could be hundreds of millions of gallons of water stored that is running to waste in those three months that I have mentioned, May, June and July, and I think that this resolution is a very good one, and that it is imperative that the government should do something, because these people, when they get these records on the creek, are not utilizing the water at all, but they simply hold their record. When any other person comes and intimates that they want to get water they are up in arms in a minute and they say "We will not let you have the water because we have got it all recorded." Now I think it is up to the government to undertake to conserve this water or else to cancel these old records that have been recorded, some for over twenty years. When a man has a record on a creek and he is not utilizing that water in a reasonable time, I think that he should forfeit that record and let somebody else have it that would use it. We, in the municipality of Spallumcheen claim that we do not need irrigation, but I can assure you gentlemen that there are times when we do need it and need it badly; and I have had the matter figured out for me by a man that was very good at ciphering and he claims that this particular creek that I have spoken of, could be dammed away up in the mountains and sufficient water stored there to irrigate the whole of the municipality at a cost of not exceeding five dollars per acre. I myself would feel very much gratified if I could have the water onto my farm, which is just about 240 acres. If it cost me five dollars per acre, I would consider I was getting water cheap. I think if the government would look at this thing in a right light and would try to do something—if this resolution is backed up strongly by this Association and put in form and presented to the government, they cannot get out of it; I think we should soon have water for pretty nearly every person who uses it, because the water is there going to waste, it only wants conserving.

CHAIRMAN.—I think the question of the conserving of the water that is going to waste is one of the utmost importance.

MR. AGUR.—At the last convention held at Kamloops this very same question was thoroughly threshed out, and it was very well covered by the resolution, although not quite so much to the point; I think the resolution is quite in the feeling of the meeting to be put through, but there is an amendment here by Mr. Smith

who is now present, the wording of it leaves the government to work out the details as to the best methods of obtaining that end.

MR. CORDY.—With the consent of my seconder, I'd be very pleased to accept that as part of the resolution.

MR. PETERSON.—Yes.

CHAIRMAN.—The resolution as read is now amended by the suggestion of Mr. Agur. It leaves the government officials to work the thing out. Are you ready for the question? The resolution is carried.

CHAIRMAN.—Mr. E. C. Thrupp will now read his paper.

"THE RELATIVE ADVANTAGES OF CONTINUOUS AND INTERMITTENT IRRIGATION SERVICES."

(By Edgar C. Thrupp, A.M., Inst. C.E., of Kamloops, B.C.)

On very large irrigation farms a continuous supply of water throughout the season, is undoubtedly desirable, but on small holdings the allowance made according to some standard of continuous "duty" may represent such a small stream that it is difficult to distribute, and the cost of manipulation per acre foot becomes excessive.

The most suitable system of intermittent* service for small farms seems to be a subject worthy of discussion by the Irrigation Association, and the present paper is intended as an opening for that discussion rather than as a statement of final conclusions, because it is clearly a matter for various views in different circumstances.

The first factor in the problem, is the minimum flow that can be manipulated with reasonable economy of labor and efficient distribution, and that depends upon the nature of the crop and the distributing appliances provided.

Assuming nothing but rough ditches and fresh furrows, it will be found that a flow of less than 1.4 cubic feet per second is a poor stream to occupy one man's attention irrigating vegetables and small orchards, or preparing arable land for a crop. For such purposes a small farmer who has not been able to expend much capital in permanent distributing appliances will probably find a flow of 1.2 cubic feet per second, to be a reasonable minimum. This rate if discharged continuously for 125 days, would give approximately 125 acre feet, or say, 21.2 acre feet per acre, on a 50 acre farm. It follows that smaller areas should have an intermittent service arranged to suit the circumstances. If the farmer is doing all his own work without assistance his time will be better spent using, say, 11.2 cubic foot per second, for two days a week, rather than 1.2 cubic foot for six days and if he has hay crops on a large proportion of his land it will be easier to manipulate the water when the crops are well established.

Vegetables require much more attention than fodder crops and may need night labor unless very carefully planned to carry the flow through the night without over irrigating in parts.

With carefully graded small furrows a stream of 1.2 cubic foot per second, may be divided into 15 or 20 rows, and where sufficient capital is available, it will

pay in the long run, to put in permanent distributing works to regulate these small streams in groups by means of sluices or valves.

Whether the intermittent service should be arranged to separate night from day is also worth consideration. It will be an advantage to some men to have a service for 12 hours out of the 24, so that one man can do all the distributing without excessively long hours of work. On the other hand, there may be extra attendance needed by the irrigation works staff to turn the supply on and off, unless it can be arranged for adjoining users to share the supply from one source and regulate it to their mutual advantage.

In connection with this day and night question, there is a practical point to be observed. Common practice without continuous service leads to certain results with ditches or furrows spaced two or three feet apart and put under water for 24 or 48 or more hours. A 12 hour service will not produce quite so much lateral seepage and therefore the ditches must be closer, together with the shorter service, and a larger flow may be needed in each furrow.

The author's observations on this matter go to show that with furrows on suitable grades a service of even less than 2 hours duration gives satisfactory results with most of the ordinary vegetables, but no doubt some kinds require longer service. A good plan is to run the first irrigation in a furrow only a few inches from the line of seeds, then 2 or 3 days later, run a cultivator or plow over the ground to turn the soil over the first furrow and form a new one a few inches further from the seed line for the second irrigation and so on, until it is a foot or more away from the plants when the plants are maturing.

Whether the service is long or short there will generally be a considerable amount of water passing out of the lower ends of the graded furrows to be disposed of on a second plot of ground. Only the most experienced irrigators can avoid this and they must spend a very large amount of time in running the distributing furrows and regulating the discharge at each to get a perfect result and avoid waste. The average man will do better by having a second plot of ground levelled to irrigate itself by filling furrows or flooding all over according to the nature of the crop, which should be one requiring more water than those on the upper land served by graded furrows. The system of graded furrows for higher ground leading to level furrows, or level basins below, affords the operator a better chance of irrigating without waste of water or time, than an "all graded" furrow system.

The best time for the cultivation of the soil after irrigation is usually from two to four days after applying the water, and this fact indicates that it is undesirable to have the irrigation service on alternate days where such cultivation is necessary, but rather to have 3 or 4 days in succession for irrigation and the following 3 or 4 days for cultivation, the worker will then have a straightforward job at cultivation without interruption to attend to irrigation.

If the farm is large enough to require the employment of two or more men, these considerations do not apply, as in such cases, the men will arrange their own work and all the intermittent service on different parts of the farm to fill up the full time of the water supply.

Farmers depending on a supply from recorded streams often find themselves in difficulties owing to the diminished flow late in the season, and they may be quite appreciably benefitted by being able to store water for a few days to secure a good

flow for the next few days. Storage provided for that purpose is a very much smaller matter than storage to hold up water in the spring for use in the later summer, but for both purposes it is desirable that holders of records for definite discharges should have the right to store water if suitable sites for reservoirs can be found.

In the event of the water supply being ample for the needs of a district or group of farms a careful study of the needs of the farmers should lead to the establishment of a satisfactory time table and system of regulation for an intermittent service which will obviate disputes and waste of water.

If the total supply is not sufficient to meet the total demand, the fixed time tables should help to minimize the troubles which will inevitably arise, but no amount of care in arranging the system can make up for a supply that is hopelessly deficient.

It is very desirable for suppliers and users of water to think over these points and exchange ideas on the subject, and to keep records of their observations for references at the right time rather than to rely upon vague recollections of what happened in times gone by. Suppliers are generally more careful in their records than users, and this paper is more particularly an appeal to users of water to record their observations and come forward and discuss them in a public way, as that is the most fruitful method of getting irrigation services brought into harmony with the ideas of the farmers. The average farmer will not as a rule, be able to explain his wants in cubic feet per second or in acre feet per acre, but will generally ask the supplier or engineer to tell him how much water he will want and confine himself to asking for a "good head" of water or "plenty of water all the time." Any discussions or lectures or bulletins or practical demonstrations which encourage a farmer to reduce his ideas to definite figures and think in appropriate units, will in time, bring about clear understandings between suppliers and users to their mutual advantage and the general advancement of the science of irrigation.

CHAIRMAN.—The paper is open for discussion.

Prof. ELLIOTT.—The question is brought out there regarding the fact that farmers do not as a rule know what a head of water is, or what a second foot of water is. Might I just tell of a little experience we had this year? We felt that in the irrigation project east of Calgary here that there are a great many farmers who have little idea as to what a cubic foot of water is, or as to what an irrigating head is, and during the past June we organized some irrigation demonstrations with a view to showing the men exactly what amount to let out, how to apply the water to the land, and we had very large crowds at these demonstrations and from the expressions of the farmers, I am satisfied, that these demonstrations were very very helpful along that line brought out by the speaker. We would start on a piece of land, not the most difficult, perhaps, to irrigate, and not the easiest piece to irrigate, just a good average piece of land selected by the farmers in the district—we would start at the point of delivery and with teams and proper equipment for making ditches we would actually plow out the main ditches across the head of the field, and then plow out the small distributaries through the field; when that was done—the main point was to give them a knowledge of how to lay out actually a ditch system—when that was done, a cubic foot of water was turned into that, so that they might see exactly what a cubic foot of water was, and a practical man with a shovel in the field handled the water in distributing it over

the land. I believe that these little demonstrations that we gave this year accomplished much in showing the farmers actually what a cubic foot of water was, and actually how to use the water on their land. A practical man with a shovel can do more in five minutes than you can do in a week by talking, and our demonstrations, so far as the attendance was concerned, and so far as the expressions that we heard from the farmers, were very, very satisfactory, and very much appreciated.

Adjourned until 9 a.m.

An exhibition of the Canadian Pacific Irrigation Colonization Company's moving picture film "Home Making in Alberta," together with a short talk, illustrated with lantern slides, was given by Mr. Norman S. Rankin, local secretary of the Association, on Tuesday evening.

WEDNESDAY MORNING SESSION.

The convention re-assembled at 9.30 a.m. when the secretary read the following letters to the convention.

The secretary read the following communications:

(Telegram)

VICTORIA, B.C., August 7, 1911.

JOHN T. HALL,
Permanent Secretary,
Western Canada Irrigation Convention,
Calgary, Alta.

Very much regret am unable to accept kind invitation of Western Canada Irrigation Association to be present at their fifth annual convention, but my colleague, Mr. Ross, will be present to represent the government. My best wishes.

RICHARD McBRIDE.

EDMONTON, 31st July, 1911.

DEAR SIR,—I have to thank you for your letter of invitation to attend the fifth annual convention of the Western Canada Irrigation Association to be held at Calgary. At the present moment I am not in a position to say whether or not it will be possible to attend.

Yours truly,

JOHN T. HALL, Esq.,
Lethbridge, Alta.

C. R. MITCHELL.

EDMONTON, July 29, 1911.

Mr. JOHN T. HALL,
 Secretary,
 Western Canada Irrigation Assn.
 Lethbridge, Alta.

DEAR SIR,—I have your kind invitation to attend your annual convention at Calgary on August 8th, 9th, 10th. As these are the same dates as the Dominion Fair at Regina, I am not quite sure that I can attend, but will make it a point, if possible, to be there. I am,

Yours very truly,
 DUNCAN MARSHALL,
Minister of Agriculture.

REGINA, May 15th, 1911.

DEAR SIR,—In the absence of the Hon. Walter Scott, I beg to acknowledge receipt of your invitation to Mr. Scott to attend the fifth annual convention of the Western Canada Irrigation Association to be held in the city of Calgary, August 8, 9 and 10th, 1911. Mr. Scott is at present on his way to England to represent the province of Saskatchewan at the King's Coronation, and will likely be absent until about the 1st of August. Mr. Scott will likely be exceedingly busy for some-time after his return, and I think it very improbable that he will be able to accept your invitation for August 8th, 9th and 10th. However, I shall place your communication before Mr. Scott immediately upon his return and will further advise you should he find it possible to attend.

Yours truly,

JOHN T. HALL, Esq.,
 Secretary,
 Western Canada Irrigation Assn.
 Brandon, Man.

LOTTIE CRAIG.

REGINA, July 22nd, 1911.

DEAR SIR,—With further reference to your kind invitation to Hon. Walter Scott to attend the fifth annual convention of the Western Canada Irrigation Association to be held at Calgary, Alberta, August 8, 9, 10, 1911, I have to say that I am now in receipt of advice from Mr. Scott to effect that he will not likely return to Canada until sometime in September. It will therefore be impossible for him to avail himself of your invitation to attend the convention.

Yours truly,

JOHN T. HALL, Esq.,
 Secretary,
 Western Canada Irrigation Association,
 Brandon, Man.

L. CRAIG.

JOHN T. HALL, Esq.,
Permanent Secretary,
Western Canada Irrigation Association,
Lethbridge, Alta.

VICTORIA, August 1, 1911.

DEAR SIR,—I beg to acknowledge with thanks the receipt of your kind invitation extended through you by your president, Mr. C. W. Peterson, to be present at the fifth annual convention of your Association to be held at Calgary on August 8, 9, and 10th, and regret to say that pressure of business here at this season, will unfortunately prevent my acceptance of same.

With the very best wishes for the success of your meeting, I beg to remain,

Yours truly,
THOMAS TAYLOR.

JOHN T. HALL, Esq.,
Permanent Secretary,
Western Canada Irrigation Assn.,
Lethbridge, Alta.

VICTORIA, 31st July, 1911.

DEAR SIR,—I have to acknowledge the receipt of your letter of invitation of the 26th inst. inviting me to be present at the fifth annual convention of the Western Canada Irrigation Association which will be held in Calgary, August 8th, 9th and 10th.

I would indeed be exceedingly glad to be able to attend this very important convention, but I will be prevented owing to the fact that during the coming month, I will have to give considerable attention to the sittings of the Taxation Commission, of which I am a member.

With many thanks for your kind invitation which I am sorry to say I shall not be able to avail myself of, believe me.

Yours very truly,
A. E. McPHILLIPS.

JOHN T. HALL, Esq.,
Secretary,
Western Canada Irrigation Association,
Calgary, Alta.

KELOWNA, B.C., Aug., 5, 1911.

DEAR SIR,—I regret that the pressure of other affairs will not permit me to be in Calgary on the 8th, 9th and 10th of August, or to take part in the work of the Western Canada Irrigation Association this year.

Wishing you ever continued success, and a most profitable season at Calgary, I remain.

Yours faithfully,
CHARLES W. DICKSON,
(*Member Executive Committee.*)

R. S. STOCKTON.—I read resolution number 4:

‘Whereas, an accurate knowledge of the location and quantity of water supply available, is the basis of irrigation development, and;

Whereas, the matter of topographical and hydrographical surveys to determine the location and quantity of such water supply and the proper methods of conserving it must be undertaken by the government administering the law relating to the use of such water;

‘Therefore, be it resolved that this convention urges strongly upon the Dominion government the importance of making the necessary appropriation and providing the necessary staff to continue in an intelligent and systematic manner the work of gauging all streams of water supply and location of all sites suitable for reservoirs for the storage of water, initiated a number of years ago.’

In introducing this resolution I would like to make a few remarks regarding the United States Reclamation Service with which I was connected, and it is particularly in line in this connection, and also as bearing on the resolution discussed yesterday in regard to the government taking a more active part in the conservation of the water supply.

The Reclamation Service has been one of the largest factors in the development of the west within the last few years, both by direct expenditure and in other ways. An expenditure of \$50,000,000 in the western part of the United States has been a very large factor in the development there, and not the least benefit has been the placing of the irrigation enterprises upon a sound basis, establishing a high standard of engineering and type of construction, and has made it possible for many large private companies to float irrigation bonds, and go ahead and construct works as large as those constructed by the government, and up till the time the government began this work it was difficult to do that, in fact it was not being done at that time.

Now, one of the things which has caused the practical success of the Reclamation Service work to a very large degree was the preparation for it, which was the result of the work of the Hydrographic Branch of the United States Geological Survey, that was largely in the hands of F. H. Newell, who afterwards became head of the Reclamation Service, and for ten or fifteen years before the Reclamation Act was made law very thorough and careful work was done in the measurement of the streams throughout the western part of the United States; this data was collected by a few men who worked hard every season in the west, establishing stations and taking river measurements and laying out reservoir sites, and accumulating data that was to be published in the water supply papers, and accumulated in the records, so that when the Reclamation Service was organized they were able to take a comprehensive view of the total water supply, and general hydrographic data throughout the Western States, and attend to their work in an intelligent manner, and start in with the actual construction work at a very early date after the passage of the law; and you will appreciate of course, that hydrographic data is something that cannot be accumulated without a lapse of time; that is, the record of a stream for one year is sometimes worse than useless in that



Calgary District, Alta.:—Car and Cable on the Elbow River in Sec. 15, Tp. 24, Rge. 1, W. 5 M., Summer 1909.

it is misleading, and the great value of all hydrographic records is the length of time over which the record extends; and so I hope you will all agree very fully with the importance of this resolution, that the government continue and increase the appropriations for carrying on the work which they can carry on much better than any private individual because it is for the benefit of the whole community.

MR. THRUPP.—I have much pleasure in seconding that. I can endorse a great deal of what Mr. Stockton said, because I have read a great many of the records of the United States Hydrographic Department, and they afford a very excellent basis for starting any sort of an engineering scheme, whether by government or by private companies. I am glad to say that the Dominion government has already started in British Columbia, in that regard, by appointing Mr. Carson and a staff of assistants to start this work, but I understand from conversation with Mr. Carson the other day, that they only have a small appropriation, and he hopes they are going to have a much better one for the future, and I think this convention will assist in the matter by passing this resolution, and I hope we shall get Mr. Carson set up next year with a very much larger appropriation so that he can carry this work on with much greater effect.

I have much pleasure in seconding it.

CHAIRMAN.—The motion is before the convention and open for discussion.

MR. F. H. PETERS.—This resolution that is now before the convention practically concerns work that is at present under my charge and I would like to say a few words to you about it.

I would like you all to realize that those officers in the government who understand the conditions out here realize very fully the great importance of this work, and realize the necessity of not only carrying it on in the future but also of extending it very largely. The great trouble in the past has been that it was difficult to get money voted for this work because the ordinary public do not realize the necessity for these records. It is only people such as are gathered here who are interested in irrigation or water-power development who realize that these records must be gained and must be gained in the early history of water development of any kind to be of the most use. For this reason, it is a great satisfaction to us to have this convention pass a resolution urging on the government that they should continue the work, because it will do a great deal in starting them off to give us larger votes of money so that we can do more work.

I would like to tell briefly what work we are doing at present. Our work naturally divides itself into two classes, the Hydrographic Surveys work and the Irrigation Surveys work. As you all know, the Hydrographic Surveys work should be done as Mr. Stockton mentioned, before the settler comes in who wants to use the water for irrigation, or before the application for power purposes gets in, and as far as possible, we have endeavored to do that—to get into the farming country before the settler had got in, and we are trying now to get into the mountains before the application for power comes. We have at present, seven engineers in the field getting these records, and we have established about 130 permanent stream measuring stations. As a rule the small streams are measured by the wading method, using long gum boots or waders that come up to the waist. On the large streams we usually utilize the bridges and in addition to that we have about a dozen cable stations established particularly for our purposes. I may

say that our work extends from Frank, in the Crowsnest Pass, to Laggan, in the Bow pass in the west, south to the International boundary, as far east as the Souris river, near the east boundary of Saskatchewan, and as far north as Edmonton, and it is going to be our aim in the future, to get measurements on every stream in the two provinces that has any possibility at all of development of water-power, or for any other commercial use.

There is an article appearing in the paper this morning, which, on being read first might seem to be a criticism of the work we have done; this article was written on account of an interview with Mr. Jas. White of Ottawa, but I know very well (I see he is not here this morning, I wish he were), I can assure you that Mr. White did not mean to criticize the work in any way, because I know that he knows too well what work we are doing to do that. Mr. White is speaking particularly about mountain streams, and we have not, up to date, been able to do much work on them, because we have never had the money to do everything, and we have been doing the most important work first.



Calgary District, Alta:—Wading Section on Fish River S.W. 4 Sec. 26, Tp. 22, Rge. 3, W. 5 M., Summer 1909.

As regards the irrigation inspections; as you know, every application for water in these two provinces from any running stream or lake comes to our department and we have to oversee every irrigation scheme, whether it is by an individual or one of the few large companies. We are not very much concerned with the large companies because we feel that they are running concerns and business concerns, and therefore they will do the work in the best manner possible. We are largely concerned with the small private irrigation man who has from

80 acres, 100 acres, or 200 acres to irrigate, and these men we have to watch from the time their application comes in until the time their works are finished and finally licensed by the department.

I have no close figures that I can tell you because I made no preparation for this talk, but I think that including the railroad applications for water tanks and the like, that there are about 1,500 schemes in the two provinces; and excluding the railway applications and a number of the old small irrigation schemes, I would say that there are at least 1,000 small schemes in active operation to-day. We have at present, five engineers in the field on this work; the bulk of our work at present, is in the Maple creek district where to-day there is a great deal of development work in small irrigation schemes.

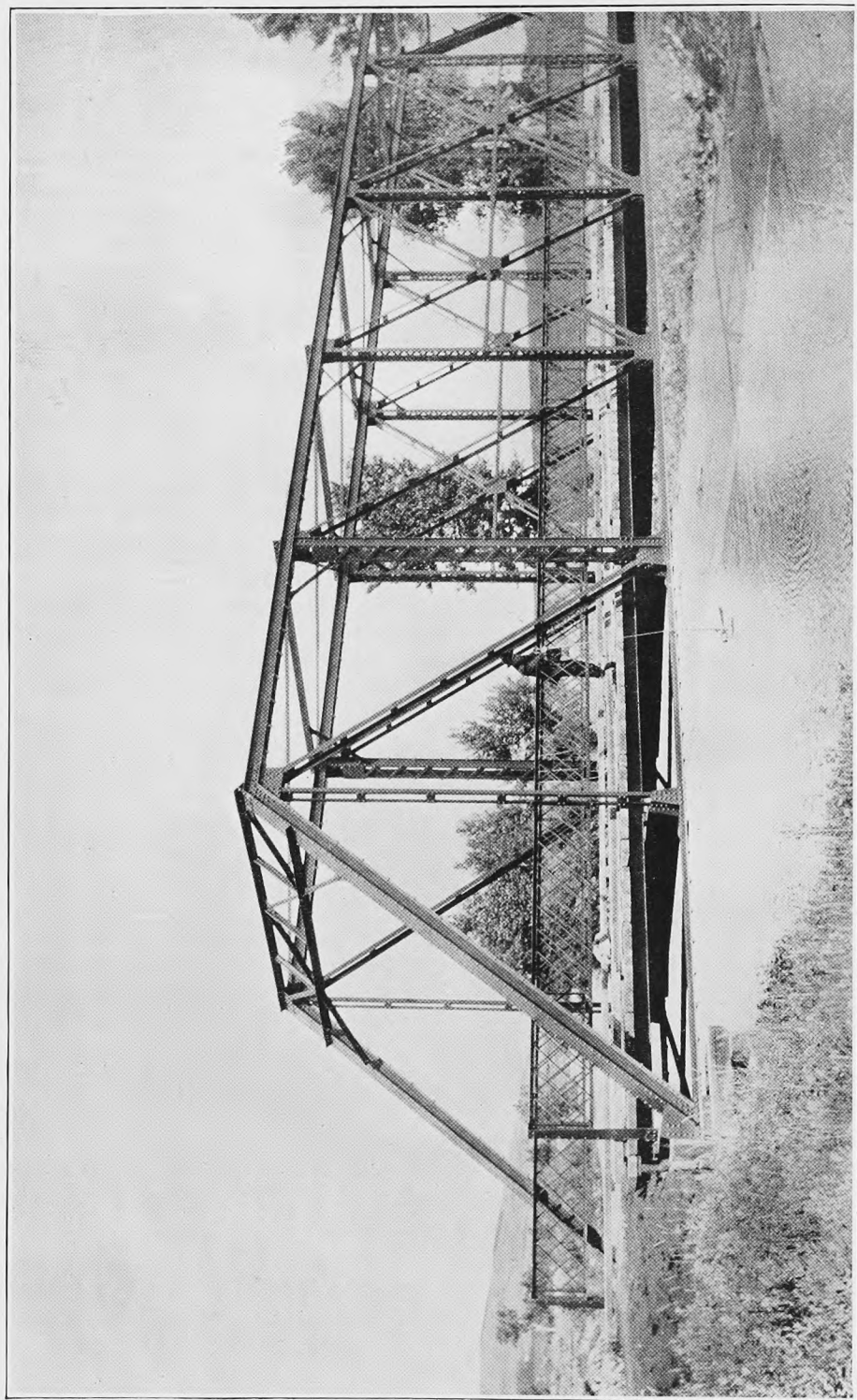
Our next most important district is the Calgary district, being that between here and Macleod, and west of the railroad track to the hills; and also further south, as far south as Waterton Lakes.

It will give you an idea of how wide our work is when I tell you that our officer on these special inspections has already been as far south and west as Lethbridge and Frank, and he has been as far east (on inspection work) as Moosejaw and Regina, and on his next trip he will go as far north as the Athabasca to inspect some drainage schemes there.

At the time that this work that we are doing was started, surveys were started to develop contours of the country, and at that time most of the money was spent in doing that work. Lately, this work has been given up and none of it has been done for some years. The necessity is now being realized to continue that work and we have tried to make a start at it this year, to get an idea of what the cost of doing the work would be, and the best way in which to do it; we have started by putting one party in the field, running two levels; they are operating in the Maple creek district.

Our intention is, roughly speaking, to first run accurate levels on all township lines, from these to run the levels on the section lines, and finally from this network of levels to develop close contour surveys of the country that might possibly develop irrigation land or reservoirs or anything of that sort. In regard to the reservoir sites especially, we have never in the past done as much work in this regard as we ought to have, on account of the old fault of not having enough money to spend. We have also made a start in this direction this year, and have put one party in the field. This party has already made an inspection and survey of the proposed reservoir site on the head waters of the Old Man river at a place called the Gap, north of Cowley, and there are also power applications at this point which were inspected. The rest of the season will be devoted by this party to making inspections of the proposed scheme to divert water from the south Saskatchewan river at a place called The Elbow, the idea being to take sufficient water out of the south Saskatchewan and turn it into the valley of the Qu'Appelle river to serve the towns of Moosejaw, Regina, and other small towns in that vicinity.

The provincial government has voted money to do that work, and we intend only to do the preliminary work, so that at the end of the season we can give them a conservative idea of what the possibilities of the scheme are. You will understand that it is very important that all this work of stream measurement and reservoir site surveys and irrigation surveys should be done under one head, because



Calgary District, Alta:—Bridge Station on North Fork of Sheep River between Sec. 7, Tp. 21, Rge. 2, W. 5 M. and Sec. 12., Tp. 21, Rge. 3, W. 5 M., Summer 1909.

the work all joins in together and it is much better to be done by one outfit, so that everybody can work well together. Just at present, the government is undertaking to do this work through the medium of several different departments; we do not know who will finally do all the work or the different parts of it, but we hope to make such a good showing in the near future in doing this work, that the work will finally all be done by the irrigation office.

Before I stop, it will be interesting to tell you that we have just completed here a current meter rating station; you know how important it is for an engineer to have always his transit and his level in adjustment; and it is just as important for us to always have our current meters in adjustment, that is we should always know the proper rating, and that is something we have never had before and we have felt the want of it, and we know that our records in the past have suffered through current meters getting out of order and our not having any means of re-rating them. We have built this station and it is thoroughly up-to-date; consists of a reinforced concrete tank 250 feet long, 6 feet wide with 5 feet of water; it is our intention in the future to extend it to a length of about 500 feet, but at present we have facilities for testing meters over a length of 200 feet.

I may say if anybody has any current meters they wish to get regulated we will be glad to do this work at a nominal sum which will cover just the cost to us, the actual cost of the man's time making the ratings, and we will be in a position to give you certified rating tables.



Maple Creek, Sask.:—Making a weir measurement of overflow from Maple Creek Waterworks N.W. 4 Sec. 20, Tp. 10, Rge. 25, W. 3 M., Sept. 1909.

MR. MUCKLESTON.—Mr. Peters has mentioned the fact that they are experimenting largely with surveys with a view of finding the cost and the best method of doing this work. I might say that the C. P. R. in the last four years, has managed to cover rather more than a million acres of land with topographical surveys. We have tried four or five different methods in making these surveys. Our experience very shortly showed us that there is no method which can compete for accuracy and for cost with the method which he has outlined in part—of the network of levels followed up by accurate close plane table survey.

The million acres which we have covered with plane table survey have cost us, by actual survey work, which includes an allowance for depreciation of instruments, and for loss of teams, equipment and for all the possible charges, it has cost us rather more than eight cents an acre; we tried several methods before that which roughly in cost were as high as twelve cents and the results were worthless, and for Mr. Peters' information, I am glad to volunteer these facts.

CHAIRMAN.—We will put the resolution to the meeting; the resolution is number 4 on the programme. I will just emphasize that the convention urges strongly upon the Dominion government this action, and I would point out that the officials here are not the Dominion government; we are willing to spend all the money we can get, you have got to get after some other people if you are going to get that money for us, and I just suggest that direction of your energies in the carrying out of the resolution. Are you ready for the question? The resolution is carried.

The next item is a paper by Mr. W. H. Fairfield, superintendent of the Dominion Experimental farm at Lethbridge.

LOCAL FARM PRACTICES IN IRRIGATION.

W. H. Fairfield.

In the few remarks I am about to make, I propose to deal with the subject of irrigation purely from the farmer's standpoint, with such questions as when to irrigate and the effect of water on the crops, etc., rather than from a technical or engineering standpoint.

In our meetings of the Western Canada Irrigation Association in the past it has sometimes occurred to me that perhaps we do not give enough attention to the problems of irrigation met with by the actual farmer on the land. The engineering problems involved in taking the irrigation water from our streams and rivers and delivering it to the farmers, or taking the water from the rivers during flood time and storing it until the time of need comes, although they are very interesting, often perplexing and always highly important, are still no more so than the problems that confront the farmer on irrigable land in a district that is so new that many of the farm operations are more or less in the experimental stage. No matter how reliable the water supply of a given piece of land may be, if the land is not suited to irrigation, that is, if it is not naturally very fertile, if the physical texture of the soil is such that it cannot be irrigated economically, if the land has not

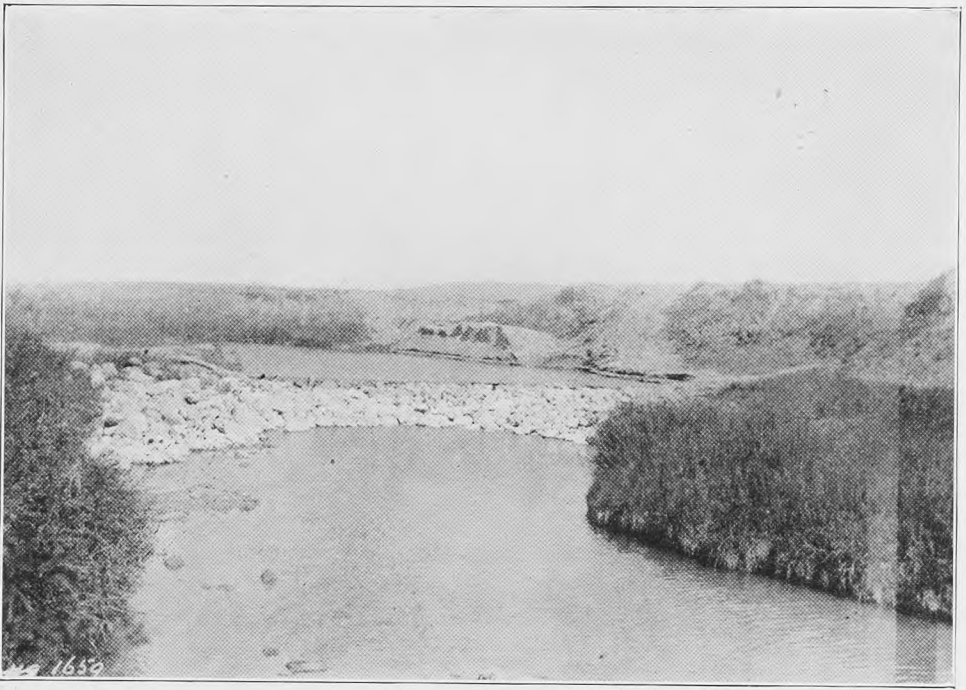
natural drainage or if the natural topography of the particular piece of land is not such as to lend itself readily to the ordinary forms of irrigation then all the expense that has been gone to to bring the water to this particular piece of land is wasted.

We do not think of saying that an irrigation project has reached completion just because water has been turned in and will flow from end to end of the main canal and all the subsidiary laterals, but rather when a family is living on every parcel of land throughout the district, and is farming profitably and living happily, for it is only then that the particular irrigation project has been developed to its natural end.

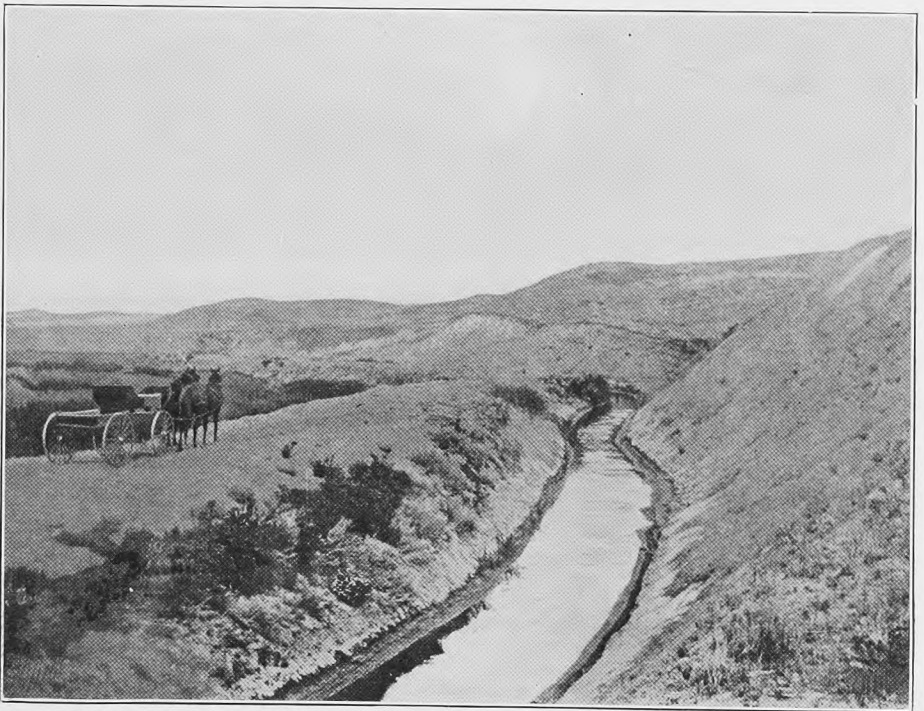
Farming under irrigation is intensive farming, consequently it takes time, often a considerable length of time, for the settlers to learn the real possibilities of their particular districts, before they find out just what crops and just how to handle these same crops to be able to get the very best out of their land. I doubt if anyone present will dispute the statement that this has been the history of practically every irrigation project of any magnitude in the western states. Just as each irrigation project in various countries or different districts of the same country have their peculiar problems, so the farmers carrying on farm operations in these various districts have unique problems that must be solved, for farming under irrigation involves the establishing to a certain extent of artificial conditions.

Speaking broadly the special conditions that confront the farmer on irrigated land in southern Alberta are, a short growing season and a rainfall which although sufficient in some seasons to produce maximum crops comes on the other hand in an erratic manner, that is, although our rainfall is usually ample for growing crops up till about the middle of June, still these conditions cannot be counted on. In 1901 the entire growing season was dry. In the present season it was quite dry during the last of May and early part of June, while in the latter part of that month we had the rains that usually come earlier, and in some portions of the province where irrigation is practised the rainfall during July has been considerably above normal. There are minor conditions which are different to many other irrigated districts but the two just mentioned, the short season and the erratic rainfall, are perhaps the only ones of sufficient moment to be worthy of much consideration.

Let us first take up the effect the short season has on our farm operations in relation to the practical application of irrigation. Under our conditions, all grain on account of the rapid development of the crop due to our long hours of sunshine, necessarily draws moisture from the ground rapidly. On account of this fact it is often a surprisingly short time from when the plants have plenty of moisture in the ground from the spring rains to when the crop has exhausted the available moisture to such an extent that it is really suffering. This along with our short growing season, makes the length of time in the early summer when it is possible to apply water to growing grain and obtain maximum results, very short. Judging from my personal experience in the past 11 seasons in the Lethbridge district, and I think the Strathmore and Gleichen district is similar in a great measure, the period when the growing grain should be irrigated is from some time in June, usually about the middle, to about the 10th of July, being roughly a period of about three weeks. If water is applied much earlier than this, the grain may not all be through stooling, and be too young and tender to stand flooding. If it is irrigated



Medicine Hat District:—Nash and Sterling's Dam on Battle Creek.



East End, Sask:—Enright and Strong's Ditch, half a mile below the headgate, August 1910.

later than this it is apt to keep the grain green too late and prevent it from ripening before time of frost, and also in some cases it may cause a second growth. Although at normal seasons this period may be three weeks in extent, still it is just possible that it may not extend to more than two weeks, so that it is very doubtful whether it is possible for the farmer to attempt to irrigate a large area of grain during the growing season and obtain the best results.

These conditions, however, are being overcome to a great extent by some progressive farmers by irrigating in the fall. Although this method of irrigating land in the fall to prepare it for grain the following spring, is not practised very generally, still some excellent results have been obtained. Some of the farmers irrigate their lands before plowing, theoretically this is the best method to follow—there is however an objection which sometimes proves quite serious, and that is if the irrigation should be followed by copious rains the farmer is prevented, by the wet condition of the soil, from getting his plowing done in proper season and is very apt to be caught by frost before he gets as much plowed as he would like.

Another method which is being followed by some is to plow the land before irrigation even when it is dry and irrigate afterwards. Of course, to do this it is essential that the land be level and well adapted to flooding while the soil is in this loose condition and still not wash. When one is farming on a large scale, this method has a distinct advantage, for the land being firm and usually dry, it is possible to get on with a traction outfit and do the plowing in a short length of time. The ditches are then made and the land is flooded. As soon as it dries off it is necessary to harrow the surface to keep it from baking or crusting. In this connection, I might mention the fact that excellent results have been obtained by irrigating winter wheat in the fall either before or after the wheat is up. Better results are usually obtained by following the latter method providing there has been sufficient moisture in the land from rains to bring up the grain.

When the land has been irrigated in the fall, it is not necessary to irrigate the following summer to produce a crop of grain under ordinary conditions. In an exceptionally dry season however, such as we had in 1910 this might not be the case, but even then the land contains so much moisture that the farmer is not crowded for time and can get his ditches made, and the irrigating done before the grain is suffering.

I think the fact is quite patent to all those who have been farming on irrigated lands for a season or more that to get the most out of irrigated land, or even to make it pay reasonably well, diversified farming is necessary. Although fall irrigation may make it possible to handle a much larger area of land in grain successfully, and on our new farms expediency would indicate that grain growing is the most profitable method to follow for the first two or three seasons, still, as soon as we get our land broken and in good tilth, there are other crops that are more profitable. Hay is one of them; hay is a crop that adapts itself particularly well to irrigation, and we are very fortunate to be able to raise alfalfa, that king of all hay crops, successfully at this latitude. As soon as we get 50% or 75% of our irrigated farms seeded to good strains of alfalfa, a great number of our present trials and tribulations with irrigation will disappear. Alfalfa is much more easily handled than is grain, for if it is not irrigated just at the right time we will not lose the entire

crop for that season, we will merely lessen or perhaps lose the yield of one cutting, for by irrigating a little later on the next cutting will be assured.

The grasses such as timothy, western rye, and brome grass, do well under irrigation but they require a great deal of water during May and June, while alfalfa as a rule, does not require it at this time, providing the field has been thoroughly irrigated the last thing the previous autumn. In this connection, however, attention should be called to the importance of thoroughly irrigating all of our hay meadows no matter what kind, late in the fall, so that they may go into the winter in a moist condition and retain enough to start on in the spring, no matter how dry the months of March and April may be.

With alfalfa in the Lethbridge district experience has shown that after the land has been thoroughly irrigated in the fall, the first crop does not as a rule, require to be irrigated, but the moment the hay is removed from the ground the field should be flooded, and if a third cutting is obtained it is necessary to irrigate immediately after the second crop has been taken off the land.

POTATOES.

There is no crop that we can raise under irrigation that produces greater yield of the highest quality when properly handled than will potatoes. In the beginning, it might be well for me to refer to the fact that potatoes raised under irrigation have not always earned a very desirable reputation for quality, but I feel assured that any lack in quality is due entirely to an ill-advised method of handling. By intelligent cultivation it is possible to raise just as dry, mealy and desirable potatoes under irrigation as it is to raise them without, and in addition one can be assured of a tremendous increase in yield. To begin with, the lands should be in a high state of cultivation. When the farmer has enough land seeded to alfalfa so that he can break up some to put his crop of potatoes on, he will have an ideal condition, for the land will not only be free from troublesome weeds but will be rich in available plant food and a rank growth will be assured. The secret in raising a big yield of potatoes of high quality is to keep the plant growing vigorously from the time the seed is put into the ground until the resulting crop is matured. This is scarcely the place to give cultural suggestions in regard to potatoe growing, but I merely wish to say a word in regard to their irrigation. If at all possible, they should not be irrigated until the young potatoes are set and are, say, about the size of peas, but unless the land is very wet, they should be irrigated about this time. The first irrigation should be very light; an excellent practice is to irrigate the first time between every other row applying just as little water as is practicable. In a week or ten days, not over ten days, if no rain intervenes, the second irrigation should be given. Continue the irrigation every ten days till about the middle of August, then allow the potatoes to ripen. After both the first and second irrigation, a very light cultivation is often advisable although after the second the vines are usually large enough to shade the ground sufficiently to make further cultivation unnecessary.

In planting potatoes when they are to be irrigated, it is necessary that the rows shall be put in such a manner that the water will run down between the rows

rapidly, for care must be taken to see that the water does not flood the vines. Under no circumstances should the water be allowed to touch the stock, but should be run in the furrows between the rows.

On the Experimental farm at Lethbridge, we have had no difficulty in obtaining large crops, they often yield at the rate of between 500 and 600 bushels to the acre.

TREES AND SHRUBBERY.

I do not propose to occupy your time by taking up the irrigation of individual kinds of crops, but I feel that it would scarcely be right for me to conclude without saying just a word in regard to the irrigation of trees and shrubs. As farmers on irrigable land, we are of course much interested in this connection, for an irrigated district is essentially a district of homes, and one can scarcely imagine a home in the true sense without plenty of trees and shrubs surrounding the buildings.

As is well known trees do not grow naturally upon our prairie soils, but with a little care they may be made to grow quite satisfactorily without irrigation, but with its aid much faster. The first essential in growing trees on the prairie, is to give the land a thorough deep and clean cultivation for one season before the trees are planted. Prairie sod should be broken in May and backset quite deep in September. Old lands should be summer fallowed. After they are planted it is positively necessary that all grass and weeds be prevented from growing near them at least for the first few years. There are only two times in the year that trees should be irrigated. If only one irrigation is to be given it should be the last thing in the fall after the leaves have fallen, so that the land will contain plenty of moisture when it freezes. As a rule, further irrigation is unnecessary, specially while the trees are young, but should the spring and summer be somewhat dry they may be improved by irrigating any time up till the first of July, but under no conditions should they be irrigated later than the 10th or 15th. The lands should then be allowed to dry out if possible, so that the succulent growth may have a chance to cure up before winter. In this way much of the winter killing of the current year's growth may be avoided.

I do not know that I have advanced any new ideas, but in concluding will repeat two points that need emphasizing; 1st; the importance of more general fall irrigation for grain crops; 2nd, the importance of getting into diversified farming just as rapidly as possible. This means seeding down large areas to hay, particularly alfalfa, for the aim of every farmer in an irrigated district, should be to get at least 60% of his land seeded to alfalfa just as soon as possible.

CHAIRMAN.—The paper is before the convention for discussion. Mr. Fairfield, I am sure, will be glad to answer any questions on the paper.

MR. PETERSON.—What about brome grass?

MR. FAIRFIELD.—The greatest objection that we have found to brome grass is that it gets in the ditches and the seed floats down and spreads and becomes in some cases almost a noxious weed; it is certainly a very disagreeable and troublesome weed among trees and shrubbery; in the middle of the fields we have not

had much difficulty in killing it, but it is a very troublesome weed among trees and shrubbery and things of that kind. I am not prepared to say that I would not recommend brome grass, there are serious objections.

MR. PETERSON.—The point I want to get at is this: I regard the question of fodder crops on irrigated land, as by long odds, the most important question, it is more important than the construction of systems or the operation of systems or anything else—the question of the best fodder crop to introduce, I want to get at. Brome grass was originally introduced into this country owing to the fact that it was a grass that would stand drouth, and found a very valuable place on the dry lands—but what particular difficulty is there in introducing brome grass as part of rotation? I think it is generally admitted that brome grass is hard to get rid of. What advantage is there over alfalfa in the introduction of brome grass; we all know the value of alfalfa in rotation, and I have not yet been able to find out the value of brome grass except on a dry farm.

MR. FAIRFIELD.—My intention was to put this alfalfa in importance away ahead of any of the grasses in rotation. There are a great many farmers who desire to raise some of the grasses for hay in addition to the alfalfa. I am free to admit that personally, I prefer timothy on irrigated land as a grass to brome grass, but all the things that Mr. Peterson has said against brome grass are true in a great measure, and although I do not care to take the stand of recommending—I do not want to be understood as recommending brome grass as a particularly good grass for the farm on the irrigated land, still, on the other hand, I do not care at the present time at least, to say that the farmer on the irrigated land should not sow it. I might say this, with our experience and the experience of a number of farmers in the Lethbridge district, that they find mixtures of alfalfa and grass work very nicely, and the advantage of that is it produces a hay that is a little more valuable for horse food than the clear alfalfa.

MR. CRANDALL.—I'd like to ask Mr. Fairfield,—reverting again to the all-important subject of alfalfa, that I think we are all hoping to get into sooner or later—if there isn't a good deal of danger of injuring your plant by trying to cut too many crops the same season, so that it will not admit of a good growth of alfalfa to start in the winter on, to prevent the drying out and the injury to the root?

MR. FAIRFIELD.—The point Mr. Crandall made, I think, is an important one, particularly that is so the first year that alfalfa is sown. It is very tender the first season and should not be cut too late, after that and it is once established, I can only give the experience we have met with in the Lethbridge district; we have been growing alfalfa there for over ten years and we have found no difficulty in cutting the alfalfa very late, we find sometimes when it is cut very late with another growth afterwards, it does not start quite so soon in the spring, but we have found no results; so far as winter killing is concerned, from that method.

PROF. ELLIOTT.—When that is true, isn't it true that you get onto that alfalfa with water as early as possible the next spring?

MR. FAIRFIELD.—No, we irrigate the last thing in the fall to avoid the early spring irrigating.

MR. CRANDALL.—I have been used to the growing of alfalfa in California, and I have in digging wells and excavating for irrigation canals, found alfalfa roots

as deep as 8 or 9 feet from the surface of the ground—that is small roots, shooting down and drawing the moisture—I think the deepest one I ever found was about 9 feet, the remains of the root in the ground. I would like to ask the professor what his opinion is in regard to the depth ground should be plowed, broken or backset before alfalfa should be planted—my idea is to not put in an acre of alfalfa on my place until the ground is plowed at least on an average of 8 inches, so that it has a good fair amount of the subsoil mixed in with the top soil, and plenty of opportunity for the ground below where the ground has been plowed to retain the moisture.

MR. FAIRFIELD.—We have found from experience that it pays well to get the ground in a fair state of cultivation, the better condition the land is in the better will be the resultant crop. I think it would be wisest to have the land plowed as deep as possible. I would not be prepared to say that the land would have to be plowed 8 inches deep before good results could be obtained, but I think we can reasonably expect better results by having the land well plowed 6 or 8 inches deep than if it was not put in such condition.

MR. PETERSON.—I want to ask Mr. Fairfield if he anticipates any trouble with the introduction of the foxtail in the alfalfa meadows. I was speaking to Mr. Stockton in connection with that and he said he never heard of such a thing; afterwards we were taking a walk over the Demonstration farm at Strathmore, and I had an opportunity of showing him where foxtail had made very serious inroads.

MR. FAIRFIELD.—You mean by foxtail the ordinary wild barley?

MR. PETERSON.—Yes.

MR. FAIRFIELD.—That weed is bad in grasses, in timothy and things of that kind, but I do not think we need to worry much about foxtail in alfalfa if the land has good surface drainage so that the water does not lie for any length of time when the land has been irrigated. That grass loves moisture and low places, and if the land, as I said, has a good surface drainage, I do not think we need worry much about it. We have the foxtail in places in the Lethbridge district, but I have never yet noticed any fields that have been affected materially by foxtail creeping in.

MR. GRAHAM.—There is one point Mr. Fairfield has missed; in my experience with alfalfa I find if you sow it fairly thick and keep it free from water—the main thing is if a man is a little stingy on the seed and only seeds about half what he should, he is sure to get in these weeds, and we are bothered in British Columbia with this foxtail quite a bit, and the idea is to seed it good and thick and it will crowd out all the wild weeds.

PROF. ELLIOTT.—I believe with Mr. Fairfield, that alfalfa will rid almost any field of weeds—and if I may digress for a moment—on the demonstration farm at Strathmore a plot was quite heavily impregnated with white cockle—anybody who knows anything about cockle knows that it is a very bad thing to get into a grain field. The first cutting of alfalfa, was made purposely a little early and just as the cockle came into bloom, in the second cutting, we got a few plants of the cockle and this year I have not noticed a single plant in the whole alfalfa field. The foxtail that Mr. Peterson has reference to was in a little piece of alfalfa that we put out for hog pasture. We had no delivery of irrigation water onto that

piece of ground last year, although it was a season for irrigation, and as a consequence the alfalfa plant quite largely died out. There was a slough on the other side of the railway track that was filling with the wild foxtail, and it blew across onto that piece, and it is because of the fact that the alfalfa was not strong that it gained a hold—had we got the delivery down there in time, and got the water on in time, I think there would have been no difficulty in regard to the foxtail. I am quite satisfied, as Atkinson of Montana expresses it, "that alfalfa will give any weed a chase for its money."

RESOLUTION No. 3.

Prof. ELLIOTT.—With regard to resolution number 3, I believe that this is a resolution that is of as great importance as the one we gave so much attention to yesterday. The actual duty of water,—that is something that we know comparatively little about, and if we are to ask the government to look into the various streams and various projects of the province with a view to extending the system to take in land that is not now covered by the ditches or by the records that are taken out, we must thoroughly understand the duty of water, and it is my impression that we ought to go into this thing very carefully and very seriously. It is a point that ought to be taken up carefully before the resolution of yesterday can find its greatest force. The real duty of water—what is the duty of water in this country; some of the States to the south of us, Wyoming and other States, have gone at the thing in a systematic manner for a number of years and they are finding very varying results. It seems to me that this is almost a prior thing to our resolution of yesterday, and it is of such importance that I have very much pleasure in recommending the movement and passage of this resolution:

‘Whereas, a knowledge of the practical duty of water for various crops has a most important bearing on irrigation development; and whereas information upon this important question available in any of the provinces of Alberta, Saskatchewan and British Columbia is vague and incomplete;

‘Therefore, be it resolved that the attention of the governments interested should be directed to this important matter, and that they should be urged to carry out a thorough system of investigation to determine the duty of water in the different provinces and for the different crops, so that such duty may then be determined with approximate exactness.’

Mr. PETERSON.—I am the seconder.

CHAIRMAN.—Any discussion on this resolution?

Mr. PETERS.—I'd like to say, as Mr. Campbell said sometime ago this morning, that if this convention could in any way, get the powers that be in Ottawa to give us the money, that we all consider it a very important thing as Mr. Elliott says, and we would be only too glad to undertake experiments to try to find out what the proper duty of water is.

There is no doubt about it but it is a very important question, and it is a question that really should have been decided before this time, so that no matter how quickly it is decided after this it will be late anyway. I remember discussing

this matter this spring, for a short time with Mr. Stockton of the C.P.R., and he mentioned a fact that brought out a point, that seems to me to be a good one:

A number of people are saying that the government duty of water is too high, and Mr. Stockton made the point that it is a good fault to have the duty of water high, as high as possible, because one can look around to-day and see, without making any surveys or anything else, that there is more land to be irrigated here than there is water to irrigate it, that is, without going to very great expense, and therefore by keeping up a high duty of water to-day we will eventually get the maximum amount of land under irrigation with the water that is available. It may be possible that the duty of water is a little high, and I do not claim to be an expert on the matter at all, but I would say myself, personally, that a careful irrigator can grow any kind of a crop here at all if he applies the water properly with the two acre feet that is now the local duty.

Mr. FULTON.—I agree with the mover of this resolution that it is a very important matter. He mentions Wyoming; Wyoming, if I remember right, fixes the duty of water in their Act arbitrarily—probably since then they have been investigating to ascertain what the duty ought to be. To my mind, it is a thing that will vary very greatly in the different provinces, and it will differ in different provinces—in one locality from what it does in another locality, depending very largely on the nature of the soil; and as pointed out in the resolution, it will vary for different crops. In British Columbia, it is one of the duties of the Board of Investigation to get information and investigate as to this duty of water, but it will take a long time, I believe, before they will have enough data to be able to advise at what that duty should be fixed, and even then it may be found in different districts there will have to be a certain latitude allowed to the official in charge who is determining what that duty should be.

I fully agree with this resolution that it is a very important matter that the different governments should proceed with as little delay as possible to obtain the data suggested by this resolution.

Mr. PETERSON.—I second that motion. I think what Mr. Peters says is perfectly true, that having the duty placed high is not an unmixed evil by any means; the general tendency I think, in all irrigating countries, is to increase the duty of water from time to time, as the methods of the farmers get more and more perfected.

In Wyoming, I believe the duty of water is a second foot every 80 acres; the duty of water in Alberta is very nearly twice as high as that, and I am not prepared to say that the duty of water is too high, because we certainly get more rainfall in this country, and it is only reasonable to suppose that the heavier the rainfall the duty can be correspondingly increased. It would have been impossible for the Dominion government at the inception of irrigation in this country to have fixed the duty of water with any degree of exactness; as a matter of fact, to ascertain the duty of water, it must always be more or less an approximate attempt. It would be impossible to fix the duty of water in any accurate degree; the season gives the duty or the crops for instance. In Wyoming, I believe, the duty of water on alfalfa has been found to be a second foot for only 50 acres, while the duty of water on all other plants has been a second foot for nearly 200 acres, so it will depend entirely on the crops and on the season. At the same time we all realize

that to ascertain even approximately the duty of water, will be a matter that will take a great many years, because in any one year or in five years it would not be by any means conclusive; yet there isn't the slightest doubt that the investigation ought to commence at once to ascertain the duty of water on the different crops, then in averaging the results so as to get some kind of knowledge on the subject. There is only this to be said, I think the resolutions passed here by this convention should be seriously handled; it is no use our sitting here and passing resolutions, and then meeting again the following year and passing similar resolutions. During the recess here there ought to be some very active work done to press these matters on the various governments so that when the convention meets here again the executive committee will be in a position to say this resolution was passed, such and such action was taken, and our reply was so and so. Before the convention opens another year, we should have a conclusive reply from whoever that resolution is directed to, either that the thing is utterly foolish and cannot be done, or that it is going to be done and when it is going to be done, then when we find that no further action is taken on it it will be time enough for us to go at it again. I think we are wasting a good deal of the time of the convention every year by rehashing resolutions that have been passed before, and I think this time we ought to make it our business to see that once a resolution is passed it is seriously dealt with, and that we have a proper report as to the fate of that resolution before we meet next year.

CHAIRMAN.—We have the honor of having with us, representing the government of the province of British Columbia, the Hon. Mr. Ross, who is in charge of the Land Department, and I am sure that we would all be very pleased indeed to hear from Mr. Ross at the present time; although he is speaking while this resolution is before the house, I am sure you will allow him the privilege of speaking in a general way if he wishes to do so, instead of speaking purely to the motion.

Hon. W. R. Ross.—Mr. Chairman, your honor, and gentlemen: I considered it part of my duty as Minister of Lands in the province of British Columbia to attend this congress in person, not with the idea of being able to disseminate any information that will be of use to you gentlemen, but for the purpose rather of acquiring what general information I can with reference to the question of irrigation.

These gentlemen who accompany me from British Columbia know that this subject is one of the subjects included in the general operation of the Lands Department; they also know I have not had any practical experience along the lines of irrigation, or in fact any experience at all with reference to the practical use of water, and the only experience I have had is that which comes to one in the ordinary practice of law.

Now, as I say, I came with the idea of keeping my mouth shut, to a large extent, and my ears very wide open, and I would like to continue that policy all through the meetings of this convention. However, my friend Mr. Campbell has asked me to address the convention, and I may say that it affords me individually a very great deal of pleasure, indeed, to be here in order to learn what I can from those men who are to-day making a success of the irrigation problems in western Canada. I have not been very long in office in British Columbia, and consequently

I am not in a position to say in what respect our problems compare with your problems, but from what I have learned this morning, I imagine that the question of root crops and grasses and products of that sort are really the ones that you devote your particular attention to, while we in British Columbia are more interested in the question of fruit.

Now, it has been the privilege of some of my predecessors including Mr. Fulton, to be at these meetings of the Western Canada Irrigation Association, and I have noticed that when they come in their individual capacities they are most lavish with their promises of financial aid, and I notice that they sometimes rush into questions and give their support to problems that afterwards when they are charged with the duty of administration, they leave severely alone. So that I think it would perhaps be better for me to take a leaf out of their various books and to say nothing that will perhaps commit me to something as an administrator later on, which would perhaps raise some problem which the general government would have to meet.

It has given me very great pleasure indeed, to have been, thus far, at this convention, and I trust before it closes, I will be able to take back to British Columbia many things that will be of importance to us in the working out of our problems in that province.

CHAIRMAN.—Re resolution No. 3, are you ready for the question? The resolution is carried.

Prof. ELLIOTT.—Following out what Mr. Peterson has said regarding this very thing, would it not be a wise thing on the part of this convention to let each province appoint a man for themselves, a man to represent each province to deal with this thing thoroughly during the coming year; let him as far as possible, get the information necessary, and let him be responsible for that thing in his province, and then let him report back to this convention next year what has been accomplished; I believe firmly, that we ought to follow these things up systematically, and get at some point in the accomplishment of what we want.

CHAIRMAN.—What is the view of the convention in regard to that?

Mr. AGUR.—The old story of too many cooks spoiling the broth, and if we have a secretary who understands his business and it comes to it, it should go under his head; and there is no doubt the several statements made in reference to resolutions passed here not being attended to are true, and that they should be followed up, but I think it should come under the duties of the secretary.

Prof. ELLIOTT.—I had no idea whatever of relieving the secretary of any responsibility that might be his, but I imagined possibly there might be individual problems in each province, and that a man in that province might know more of these, and might be able to follow them up more thoroughly; that is rather the idea that I had, and not any idea of taking any responsibility from any man, but just to accomplish what we all wish to accomplish with these resolutions.

Mr. AGUR.—I think probably, we have been remiss all around; the executive may have been at fault; there are members on the executive, capable men in each province, and these men, with an active secretary should accomplish just what Mr. Elliott points out is so necessary; I think if they worked in unison they could accomplish just what you want; it is a matter of appointing capable men in Alberta and the same in British Columbia.

CHAIRMAN.—Perhaps the best way to deal with that will be to send it into the executive committee with the suggestion that they do something more active than they have done in previous years.

We are now to be addressed by Mr. James White, secretary of the Dominion Conservation Commission:

ADDRESS BY MR. JAMES WHITE.

Secretary Dominion Conservation Commission.

Mr. Chairman and gentlemen,—I hoped to come here as an auditor and not as a speaker, and the first information I had, I confess, that I was to address the convention, was when the secretary announced that yesterday morning, and consequently I have no paper whatever, and I have a very heavy cold. I think a few words respecting the work of the Conservation Commission during the past year may be of interest to the meeting, and that is all I propose to do, and to put it in the briefest possible form.

In commencing the work of the Commission it was necessary to block out a basis upon which the Commission should work, and after due consideration Hon. Mr. Sifton, our chairman, decided the best way would be to appoint seven committees, each committee being charged with one or more natural resources. The number seven was arrived at as, so far as the Commission was able to decide, being the number that would best cover the work that was to be done. The second annual meeting which was held at Quebec in January last, was the first meeting at which the Commission was able to report the results of that work. The first meeting was merely a meeting for organization.

The committee on agriculture reported that they had examined a number of farms in each province, averaging about 100. I need not touch in any way upon the results in other provinces, but I may say in the Northwest one of the principal things that was referred to in this report was the increasing prevalence of weeds, and that I am sure, is a matter of great importance to all irrigationists. Of these weeds wild oats were found to be the worst, and they ran to 100% on the farms in Manitoba, 71% in Saskatchewan, and 3% in Alberta. Speaking in a general way—very generally—something the same percentage was found throughout the other provinces, showing that so far as weeds are concerned agriculture is deteriorating in Manitoba, also that Saskatchewan and Alberta will have their troubles if steps are not taken to prevent the spread of these weeds.

This work is being continued this year in each of the provinces, and as these returns come in with the increasing number of farms examined, the returns received will be of greater value. In addition to that, Dr. Robertson, chairman of this committee on agriculture, has also arranged to have some alfalfa demonstration plots in the province of Quebec. The province of Quebec is one of the largest growers of hay in the Dominion, and he is of the opinion that if people introduce alfalfa growing there it will be a tremendous advance on the growth of the usual timothy and clover. The method followed is to have an amount of seed sowed on ten acres, and the planting and cultivation and everything done under the direction of a man appointed by the Commission. The farmer, in addition of course,

to receiving the crop, also receives a small subsidy in return for setting apart this part of his farm, and I think you will all agree that if it is a success and it is adopted, it will be of much benefit to the farmers of that province.

The committee on fisheries has issued a very extensive report which is now being placed in the hands of the people of Canada; it contains a summary of the laws of each province, and also contains the regulations made by the Dominion with respect to fisheries throughout Canada. It contains a very excellent report on the oyster fisheries of Canada, which are decreasing at an alarming rate. To show you the result of the methods that have been followed, the oyster industry has fallen from 65,000 barrels in 1882 to 38,500 in 1909. To give you an idea of the methods that were followed, I may say that in the early days the oyster fishers actually took the oysters ashore, and burned them simply to get the lime out of the oyster shells, absolutely destroying the oysters themselves. In ice fishing, through holes in the ice, the oysters were dragged out on the ice, the large ones separated from the small ones and taken off to market, and the small ones left there to freeze; in summer fishing, they were picked over and the large ones picked out, and the small ones left on the shore to rot. The farmers who wished to get this oyster mud for a fertilizer, would go over the oyster beds, pick up the mud and smother all the young oysters with the mud. The commission is pointing out these things and urging the necessity for greater stringency in the regulations; the regulations must be made more stringent and must be absolutely enforced. This report also contained an article on the North Atlantic Fisheries Dispute, which is of great interest to the people of Canada as it terminates a dispute of years standing.

It also contains a report on the white fish of the Great Lakes, which fell from $7\frac{1}{2}$ million pounds in 1890 to 4 millions in 1908. The Commission strongly reports that a much larger number of fry be placed in the lakes. And to give you another instance, which is possibly a little nearer home, the summer catch of white fish in lake Winnipeg fell from $5\frac{1}{4}$ millions in 1904 to $2\frac{1}{2}$ millions in 1910, about 40% of the catch of 6 years previously. The result is there is only one reason for such a tremendous falling off, and that is an injudicious method of fishing. This report also contains separate reports on each province by the best local authorities.

The Mineral Committee has issued a report on the Mining Laws of the Dominion, and each of the various provinces. Also a report on the possibility of conservation of our various mineral resources; the possibilities are greatest in the coal, and that of course is of interest to the people in the prairie provinces. While you have enormous stores of coal it is unquestionable that the mining of this coal must be so carried out as to get the maximum production out of it, out of each and every seam, otherwise we may have the same wasteful methods that have obtained in the States where it has been shown that one and one half tons of coal has been wasted for one ton that was put on the market; under the recent improved methods they have reduced that to about a half of one ton. Our mining engineer is at present in British Columbia and will also visit the mines of Alberta and Saskatchewan with a view to ascertaining what economies are being made in this respect, and what methods are being pursued.

In this connection also, there is a very important point, the continued con-

servation of human life, and measures have been taken with reference to protecting the lives and limbs of the employees.

I pass on to the question of water powers. I should say that the report on agriculture, fisheries, and minerals has been printed, and I hope at the end of this meeting to get a list of the members who attend the convention and supply each and every one with a copy. Our report on the water-powers is now in the press; it covers, in an exhaustive way, the powers in Ontario, Quebec and the Maritime provinces. When we attempt to deal with the powers in the prairie provinces and British Columbia, we find a lamentable dearth of information, and Mr. Arthur White of the Commission is now attending the convention prior to a meeting in British Columbia to get information respecting the powers in that province.

I notice in the morning paper that I am credited with saying that the stream measurements in Alberta and British Columbia are unreliable and most deficient. It only shows that at no time, and in no place, can a man expect to get reported correctly. What I said to the reporter was that the measurements in British Columbia were most deficient and inaccurate, such as they were, except in a few special localities where water-power plants have been established, or are being established. Nothing was further from my intention than to reflect in any way upon the admirable work that is now being done by Mr. Peters, and I only hope the government will increase the grant and extend the work.

The Commission is in every way avoiding anything that approaches administration. The idea is to utilize to the best advantage and the greatest extent, the work of any and every organization, Dominion, provincial or private, and we only hope that the Department of the Interior will do a great deal more work along the lines upon which they have been working.

In connection with this committee on water and water powers we have also of course the question of a commission on water, which is a most important one; it is useless conserving our resources if we do not at the same time, conserve the public health, and the life of the public. Our Public Health Committee investigated the Ottawa epidemic of typhoid, where we had from 1,000 cases of typhoid about 90 deaths, solely due to the most gross carelessness in allowing polluted water to enter the water mains during fires. When one says 90 deaths, that does not by any means represent the toll of deaths that will follow upon that epidemic. I myself, have personal knowledge of five others that have died as a result of that epidemic. It is absolutely preventable; typhoid is a dirt disease and is absolutely without excuse. It has been almost banished on the continent of Europe and by Great Britain, in the large cities at any rate, and that it exists to such an extent in the United States and Canada to-day is a reflection upon the sanitary authorities of this country—of both countries.

This Public Health Committee is also investigating the water of the Ottawa supply. Ottawa is a fair example of the average municipalities in Canada; a few miles above the city, there is the town of Aylmer with a population of 4,000; when Aylmer proposed to turn their sewage into the Ottawa river the people of Ottawa were very much excited over the danger to their health; at the same time Ottawa is turning its sewage into the Ottawa river, utterly regardless of the people on the Ottawa stream; in connection with that I am sure that anyone who has attempted to take a bath in Calgary must have been struck with the fact that the water

supply is not all that it might be. (applause). There is one idea that obtains amongst the people of this country and that is that there is such a thing as a pure water supply. Speaking largely there is no such thing as a pure water supply, that is to say if the water supply is pure to-day it may be impure to-morrow, and no municipality is justified in installing a plant for the supplying of water for domestic purposes—water that will be drunk—unless that water is filtered. Speaking in a general way, impure water filtered is better water than so-called pure water unfiltered.

This Committee has also undertaken an investigation respecting that dreadful disease, infantile paralysis, with its very high percentage of deaths, and with its disastrous after effects in case the patient recovers. Last year in October we had a public health conference to which we invited representatives and medical health officer of the Dominion, and of each province of the Dominion, and a number of valuable resolutions were passed, and amongst them one providing for the establishment of a laboratory for the manufacture of antitoxine. It was shown that antitoxines that should have had a percentage of 500, had a percentage of 10, 15 and 20, so that when the doctor administers an antitoxine he has no guarantee that it will have the desired result. Other valuable work was done along the lines of urging the establishment of mountain sanatoria for tuberculosis, the dreadful white plague of this country that has taken so many valuable lives and will take so many more, which, like smallpox, can be absolutely banished, and there is really no more reason for the existence of that in the community than there is for smallpox. It was proposed that certain areas be set aside where sanatoria could be established, and these cases treated somewhat analogous to what we find in Sarnac Lake, New York, and St. Agathe, Quebec, and other places. Anyone, who like myself, has had a chance to investigate the work that is being done in these places cannot but be struck with the enormous percentage, relatively, of recoveries in these places as compared with the number that recover in the home.

The Committee on Forests conducted an extensive investigation respecting the fires that we had in the prairie provinces, Ontario, and British Columbia, last year. In doing this of course, we enlisted as far as possible, the assistance of the Dominion authorities and of the various provincial governments.

One of the most remarkable things that was shown by the report was the fact that in British Columbia 33% of the known causes of fires were railroad locomotives, and the number known to be set by locomotives was 25% of the total, showing that in all probability railroad locomotives can be blamed for 30% of the fires that have occurred in B.C. in 1910. The convention made recommendation to the government recommending that the Railway Act be amended to provide for a fine of \$1,000 for each and every fire set by railway locomotives, unless it could be shown that the company had the best fire screens and was carrying out an efficient patrol system. The Railway Act was amended, not to provide for the fine of \$1,000, but to order the company to install the best fire fighting appliances of all kinds.

I need not refer to the setting apart of the eastern slope of the Rocky Mountains as a forest reserve—that, to my mind, is one of the greatest advances that has been made so far as protecting the forests is concerned since the system of forest protection was initiated, and I only regret that the British Columbia government

has not set aside larger areas in that province. I cannot conceive of any greater advance than to have the western slope of the Rocky Mountains set aside as a forest reserve; west of the Rocky Mountains we have a great valley, kept by the Kootenay, Columbia, Fraser and other rivers, extending as far north as we are, which should form a natural barrier.

Now, I think that covers the work of the commission in a very brief and general way, and as I said before, Mr. Arthur White is here, and I would suggest that he make a few remarks respecting the work on water-powers in Canada, more particularly with reference to British Columbia, and the prairie provinces.

ADDRESS BY MR. ARTHUR WHITE.

(Dominion Conservation Commission.)

As the secretary has just said, he was unexpectedly asked to make some remarks; and I, also, was quite surprised when I found my name mentioned in this programme. However, I will be pleased to endeavor to set before you, in brief form, and only suggestively, some of the work being undertaken by the Commission of Conservation in connection with the water powers of Canada.

As the secretary has mentioned, a report is in process of publication entitled "The Water-Powers of Canada." This report, on account of the difficulty experienced in quickly securing water-power data in the West, deals chiefly with the portion of Canada lying east of the Manitoba boundary. The introductory pages of this report will set forth, suggestively, important uses to which waters may be applied, other than the development of power. If one examines the interests which are primarily dependent upon the use of waters in the different parts of Canada, he is compelled to recognize the fact that the chief interests of one community are not those of another.

In the province of New Brunswick, for example, the chief interests using the waters are probably timber-driving; on the Great Lakes, navigation; and this convention bears testimony to the importance of water being used in the West for irrigation purposes. When the extensive use of water has become well established in any particular locality it has usually been found that certain interests have already secured control of a large portion of the waters, to the shutting-out of others who would have been glad to have shared in the use of the water had they had opportunity to secure rights at an early period. A condition of affairs somewhat corresponding to what I have just indicated has been mentioned at this meeting as existing in respect to water rights for irrigation purposes in the West. In this connection a few remarks may here be in order. These remarks may also be some encouragement to those who are seeking to have these abuses remedied. When questions of water rights have been dealt with in other provinces, the action taken and the results accomplished show that the conditions were far from hopeless. For illustration, in the province of New Brunswick certain log-driving interests had secured control of waters, notably on the St. John River, and other companies were allowed to have their logs stranded in the upper contributory streams, or held up at disadvantageous places along the river, while the company who had the controlling

of dams released the waters and got their logs well away to the mill. In this instance it became necessary for those who felt that they were unjustly bearing a burden, to agitate, in one form or another, to bring these matters to the attention of the proper authorities. After some years of agitation and effort a commission was appointed by the federal governments of Canada and the United States to deal with this one particular issue. The Commission was formed along somewhat similar lines to the Commission known as "The International Waterways Commission," which deals principally, with matters on the Great Lakes Systems. Again, in the Province of Ontario, large interests were getting very considerable control of the water-powers, especially at Niagara Falls. Those who foresaw that the public would suffer from such control were forced to agitate to bring these conditions to the attention of one authoritative body after another, in the hope that something could be done to alter the circumstances. The efforts made to remedy the condition of affairs at Niagara Falls were those which almost directly resulted in the formation of the International Waterways Commission, empowered, as you know, to deal with the waters along the international boundary.

With regard to water-powers in the Province of Ontario, public-spirited men began to foresee the burden that in the future would fall upon the whole community if the forces which were operating to get control of the water-powers were allowed to prevail. Here again public attention was focused on the menacing conditions, public opinion was aroused and as a result of this agitation, the Hydro-Electric Power Commission was formed. This Commission has wide powers conferred upon it by the Ontario government, and has jurisdiction, not only over the water-powers but also in a large measure over the rates charged by those who develop the powers.

The reason that I am mentioning these affairs at Niagara and upon the St. John River is to indicate that conditions had been created which looked as if large portions of the community were doomed to suffer, just, as has been pointed out in this convention, that, in certain districts, prior interests have usurped waters which could better be distributed in beneficial application to many other people. It has here been queried, How can such a condition of affairs be remedied? I have, therefore, mentioned these other instances in order to show that where somewhat corresponding conditions did exist, these conditions were, in large part, remedied. In some cases, however, not before what might have seemed very drastic legislation was enacted to clear away the difficulties.

In considering remedial work of this character, I have been struck with the fact that the burden has primarily, and for a long time often, been carried by a few public-spirited men. Conventions may have been called and committees appointed, but the work, the real work that was done to get reforms initiated was done sometimes by one or two men. It often took a year, two years or more, in order to get sufficient data together so that when the pioneer workers, so to speak, made statements, they had the facts back of them to carry conviction to those to whom the general condition of affairs was being presented. In the case of the Hydro-Electric Commission of Ontario, for two or three years a few men nursed things along, making inventories and securing other data. Assistants, for example, were engaged to make a personal canvass of every manufacturer in certain districts, in

order to ascertain his power needs. When these data were gathered they formed a basis upon which something more could be done than, as it were, just discussing the difficulties which existed.

I could not help but feel yesterday in listening to the statements that were made with regard to difficulties which existed upon certain waterways in the West where water rights had already been taken up by some, to the shutting out of others, that one or two particular instances of such abuses would have been of great worth. If, for example, a map of a certain district, showing the area contributory to its waters, the number of landholders on the particular stretch of territory which might be irrigated, the number of persons who actually held the water rights and the amount held by each, the number of acres which represented the amount of water that was held, and the number of acres that were excluded from the use of the waters, then a presentation of facts of this character—if the facts were carefully and fairly obtained—would give a basis upon which discussion could have centred. It could then be said, "Here is an instance representing conditions which exist." Now, in cases such as I have mentioned upon the St. John River, and in the case of the Hydro-Electric Commission of Ontario, data of the character indicated were first carefully gathered. Then when such data were presented to the parties who could put the legislative machinery in operation, it was recognized that the people who were seeking an improved condition of things intended business. I have mentioned that this preliminary work was often done by a few individuals, who recognized the needs and understood the abuses. These benefactors, for such they are, gathered the information and then handed a well prepared brief over to those who were able to deal, in a representative capacity, with bodies empowered to grant legislative authority to remedy the abuses. May it not be that a course resembling that just suggested could profitably be adopted in connection with effort made to remedy the abuses which exist respecting waters usable for irrigation?

Now more particularly with regard to water-powers, it is proposed in the province of British Columbia, and the prairie provinces, to gather some information respecting water-powers.

It is not, at this time, the intention of the Commission to gather water-power data of a specially precise character. Nor is it the intention now to adopt detailed methods, such as are employed by the Irrigation Branch of the Department of the Interior. The Commission desires, as quickly as possible, to make a list, or inventory, of all the water-power sites, either developed or undeveloped, of which knowledge may be obtained without undue expense. Such a list will give some idea as to what are the water-power assets of each respective community.

It has been the custom in gathering similar information elsewhere, to make a tabular list of the water-powers. In such a list appear the name of the river or lake, as the case may be, where the water-power is located; the local names of the respective falls or rapids; the computed areas of the respective water-sheds, as taken from the best available maps; the head, or height, of the fall or rapids (in feet) obtainable at each particular site; and an estimate of the available amount of horse-power. Such estimates are based upon the best obtainable measurements of the flow of water in each respective stream. Such an estimate, where data are meagre, is necessarily of the nature of a guess. However, in the absence of data

of a precise character—and which it takes years to obtain—estimates, such as have been referred to, are welcome to many persons who desire to have some idea of the water-power possibilities of various power sites.

The nature of such data may be apprehended from the following:

Name of river—Smith River.

Name of falls—Beaver Falls.

Area of the watershed—370 square miles.

Head obtainable—320 feet.

Estimated low-water flow—110 cubic feet per second.

Estimated low-water 24-hour horse-power, theoretical—4,000.

Remarks—Direct fall of 100 feet, and fall of 220 feet in about 3,000 feet of rapids below the falls. High, rocky banks, two miles above Smith P.O.

These data will be accompanied by an index map which will show the locations of the various power sites. Such data may possibly suggest the need for further legislation in order better to conserve these resources.

I will be much obliged to any person who has knowledge of water-powers if he will communicate with me, care of the Hotel Vancouver, Vancouver, within the next month or two. I would be very glad to avail myself of the data; and in moving about here and there through the province I will be glad to call, if possible, on any name given me, and secure such assistance as might be rendered.

I thank you very much for your attention.

CHAIRMAN.—Resolution No. 5

MR. FAIRFIELD.—Let me read the resolution:

“Whereas, a Provincial University has now been established in Alberta; and whereas, ex-Premier Rutherford made the announcement, prior to his retirement, that a Provincial Agricultural college would be established therewith; and whereas, the present government of the province of Alberta has made no announcement in regard to the location of the proposed agricultural college; and whereas, the far reaching importance of agriculture under irrigation demands imperatively that proper attention be paid to this subject in the curriculum of any agricultural college established in the province of Alberta; and whereas, such would be impossible unless the college farm was so located as to facilitate demonstration work under irrigation, thus giving students an opportunity to study the practical side of the artificial application of water; and whereas, under the climatic conditions of the province of Alberta, agricultural demonstration work without the aid of irrigation may be successfully prosecuted in almost any portion of the province, thus making the location of the agricultural college an immaterial one as regards the interest of non-irrigated lands; and whereas, the gravest objections also exist to the policy of associating too closely colleges solely devoted to agricultural education and universities devoted to general educational work.

Therefore be it resolved, that this convention emphatically places itself on record in favor of the policy of having the provincial agricultural college of Alberta disassociated entirely from the provincial university and situated in a district where irrigation by gravity may be practised.”

Now, from the wording of the resolution it appears to me that the fact is so self-evident, that to give practical instruction in agriculture, so far as it is related to irrigation, it would be impossible to make it at all practicable unless the college farm was located where irrigation was carried on, not in some theoretical manner, but in a practical manner by gravity; I will not take up your time by trying to say anything further to emphasize that fact. As to the location of the agricultural college, there is one point that interests me very much, that is the fact that where agricultural colleges are located at the same place that the universities are, in very few cases are the agricultural students on the same ground—accepted on the same ground—socially, and otherwise, as are the regular university students. There is a reason for this; in agricultural education it has been found that for an agricultural college to give the best results to the farmers generally, we should have a short course, that is, it should not be as long in years at least, as are the courses necessary to prepare a man for law, medicine, and so forth, and an agricultural education must necessarily be a technical one; and being short, the boys go to the university and are there a short length of time and do not get a chance to get on the inside of all the college life and college association; they are treated as “hay seeds.”

The result is that the agricultural college when it is a part of the university, is apt to be a good deal of a lean-to to the university; those in favor of combining the agricultural college with the university suggest, or call attention to the fact that some of the institutions on the other side have alternately combined the university and the college successfully together, but it appears to me that these are institutions where they have a very large membership, a very large enrollment of agricultural students, and that the agricultural overshadows the university, you have really an agricultural college rather than a university. To make myself perfectly clear, the stand I take, personally, on this is I believe, that the agricultural college should be affiliated with the university, but I believe it will be a mistake if the agricultural college is located at the same place, in the same town or city as the university. Now, without further ado, I want to say that it gives me a great deal of pleasure to have the opportunity of moving this resolution.

PROF. ELLIOTT.—I take very much pleasure in seconding this resolution. I happen to have had a few years' connection with an agricultural college, ten years almost, and I can speak a little bit from actual experience in that connection. I believe for the interests of an agricultural college that it should stand on its own feet—agriculture to-day is as great a science as any science—someone has said that there is as great a study, as great an education in the study of a corn root as in the study of a Greek root, and the one is a heap more useful than the other. (Applause.) That is absolutely the attitude I take with regard to an agricultural college; agriculture to-day is a profession, it is a big enough profession to demand an institution for itself, and it is a profession big enough to stand upon its own feet; and I say that no agricultural college ought to be affiliated—I will go a step further than Mr. Fairfield—that it ought not to be affiliated with the university;—I believe it ought to stand on its own feet. If agriculture in Alberta is worth anything it is worth an independent institution that will give to the boys of the province of Alberta the proper training that they need. What Mr. Fairfield has said is undoubtedly true with regard to the attitude of the men who are studying the principal

sciences, or taking up a classical course, as a rule they disparage and look down upon agricultural students; that is an actual fact in institutions, except in institutions like Wisconsin where the agricultural men are the big men of the institution; Babcock and Alexander and men of that calibre, they are the big men of the institution and therefore give the institution its prestige and standing. Alberta is an agricultural province, and it seems to me that the agricultural college ought in no way to be affiliated with the university. Then there is the other side of the question, young men who are studying agriculture in Alberta ought to have the two phases of the education, dry land work and the irrigation system; I am not giving the idea that the agricultural college ought to be placed in a locality where the students would only have irrigation, that would not be fair to the man who is on the dry land. Some particular place ought to be very carefully selected where the students would have the opportunity of studying dry land conditions and also the irrigated condition, so that the young man taking the agricultural course would not have a one-sided education, but would have an education bearing upon all phases of agricultural work; for that reason I believe the agricultural college ought to be located at a place where this might be possible. I have no idea whatever as to where that place ought to be. I think the men who are interested in agriculture in the province of Alberta ought to have a word as to where it should be, a commission ought to be appointed to go into the matter to see where the location ought to be, so that all interests might be very carefully guarded and so that the students might have an opportunity of studying all phases of agricultural work, not alone irrigation or the dry land work, but the stock work in all of its varied branches; an agricultural student ought to have the opportunity of getting everything; the field is getting so large to-day the young men of course cannot all specialize along all lines, but they ought to have an opportunity of understanding what their brother agriculturalists are studying along certain lines; my idea is that a course ought to be general, as it were, for the first couple of years, then let the man specialize at the end of that time. I have much pleasure in seconding this resolution, stating that the agricultural college ought not to be located with the university, and that it ought to be located in some place in the province where the students would have the proper opportunity of getting at the basis of agricultural work, dry land work, irrigated work and the stock work.

MAXWELL SMITH.—I am not going to discuss the resolution as it applies to the proposed location of your agricultural college, but I cannot sit here and listen to the mover of that resolution make certain remarks with reference to an acknowledged disparagement between the students of agriculture and those of the other sciences, and say nothing. Personally, Mr. Chairman, I don't think that the resolution is a proper one to bring before this convention. It is purely a local issue, something with which the province of Alberta alone has to deal, and not directly bearing on the subject of irrigation. The mover and seconder of the resolution have stated baldly that an agricultural college should not be located in connection with, or alongside of, or a part of the university. In our investigations in British Columbia, when we were discussing the question of the university there, we gathered data from all over the world, from every state in the union, to the south of us, and every country in Europe, and the great majority of evidence that we had presented to the University Commission which was sent out for the location of our university,

had a bearing in the other direction; and I have heard from the State of Washington, men whose opinion I value very highly, complain bitterly that their agricultural college happened to be located independently to the university; as I say I do not want to discuss that question because it is a local one, and I don't think it should be discussed in this convention, but, sir, I think the consensus of opinion to-day is that the agriculturalist and those pursuing other professions should be closely associated with one another; but if you want to get down to the fundamental principle, and getting back to the real trouble with our educational system, you must get back to the common every day school of your province, and there is where your trouble begins, there is where your curriculum is wrong, and there is where it begins and where it gives the other sciences and other professions a start; the young man and woman in the public school to-day do not get the same opportunity of getting the same knowledge on the subject of agriculture as they do on other subjects. If you want to amend your system begin in your public schools in Alberta, and the consequence will be that you will give your young men an opportunity of at least getting the fundamentals of agriculture, and giving them an opportunity of pursuing that on the same basis as other subjects and other sciences; but the idea of acknowledging for one minute that the student of agriculture should have to "look up" so to speak, to the other students, is the most preposterous proposition that I ever heard given out on a public platform, and I never heard such a statement in my life before. And, Mr. Chairman, if the curriculum of your public school was honestly and fairly balanced, I contend that the study of agriculture would benefit the city student, just as much as the study of the Greek and Latin roots that was spoken of, would benefit the agricultural student, and the study of plant life would be of as great assistance to the prospective physician, as the study of medicine would be to the prospective agriculturalist. I don't wish to take up the time of the convention for the reason that I don't think the resolution is a proper one.

MR. PETERSON.—It seems a somewhat peculiar statement to make that this resolution is not one that should properly be discussed at a convention of this sort. First of all, what does it aim at? It aims at education in irrigation matters for those in the province of Alberta that expect in years to come to take an agricultural college course. If that is not a proper subject for this convention to discuss, I would like to know what is? The statement that it is a purely local one is true in so far as it goes, but we have had resolutions before that are more or less local to British Columbia, and local to this province; and as long as we have an association that covers three provinces we necessarily must have instances of questions that are of only local consequence to any one province; we cannot help that. I may say this, that the location of the university in Alberta has been decided upon, and I think the university is now in full swing, if I am not very much mistaken. Placing an agricultural college in conjunction with that would necessarily mean that all irrigation instruction must be forever abandoned, and I don't think that that would be a healthy state of affairs in Alberta, considering that within the next few years we shall probably have the sum of \$26,000,000 invested in irrigation works and irrigation interests in this country, to say nothing of the enhanced price of irrigated lands; in other words, irrigation is not a thing that we want to joke with, the time has come when irrigation in the province of

Alberta must be taken very, very seriously, as one of the great industries of this country and it is a very proper matter for this convention to deal with.

PROF. ELLIOTT.—I am willing to admit with the second last speaker, that the public school system in this country is somewhat at fault, because that system is built on the idea that 5% will go into agricultural college or university work, and it is built entirely for the 5% who go on; as a matter of fact, only from 5% to 10% of the boys and girls who go through our public schools go on through the high schools, and to the university work, and the whole curriculum is based on that idea, and the introduction of industrial branches for our public schools is a proper thing, and when that is done it will be a good thing; the tendency of the present day is along the line of the sciences and the classics, it is time for the agricultural man to look after himself; the speaker was somewhat wrong in suggesting that it was our opinion that the agriculturalists must look up to the other man, that was not the idea; I said there was as much study in the corn root as in the Greek root, and the one was a heap more useful to the nation than the other, and so far as that is concerned I claim the agricultural college course is the equal of any course given on this continent, I don't give a cent what course it is, but the fact remains that you take these institutions, and I have had some little experience in them—take an institution where the boys are going together and the agricultural man is always the “hayseed” or “pumpkin roller”; the majority of the men are in the professions and they do snub the agricultural college man when these things are governed together, except in such instances as I have stated, where the agricultural college men on the staff represent the big men of the institution, such as Wisconsin. What is it that has made the Guelph agricultural college the peer of agricultural colleges on this continent? It is simply the fact that it has been a unit in itself, it has been an institution in itself, governing itself, and where the boys attending that institution had all the privileges of an agricultural course with nothing to interfere; and I say Guelph to-day stands as peer of all agricultural colleges on this continent, and it is for no other reason than the fact that the Guelph institution is an institution by itself. I am a graduate of that institution and I know what I am talking about.

CHAIRMAN.—Are you ready for the question? The motion is carried.

The convention adjourned at 12 noon in order that the delegates might partake of a luncheon tendered by the Board of Trade and City Council in the Young Men's Club rooms.

Session adjourned until 2.15 p.m. when it resumed as follows:—

AFTERNOON SESSION—WEDNESDAY.

CHAIRMAN.—The first regular item on the programme is resolution No. 1, which will be taken up now. I think the Hon. Mr. Fulton is speaker to this resolution, first.

RESOLUTION No. 1.

MR. FULTON.—Mr. Chairman and gentlemen:—I may say that after discussing the matter with two or three gentlemen in British Columbia, who from the first have taken a prominent part in this association, in its formation and conduct,

carrying on of the association since its formation, they and I agreed that perhaps the time was ripe when a move such as outlined in this resolution was made.

At the request of Mr. Ricardo, who was one of the promoters of the association, I drafted the resolution and sent him a copy, (unfortunately he is not able to be here himself) forwarding a draft to Mr. Hall to be submitted to the resolution committee. You have the resolution before you:

‘Whereas, the experience of the previous conventions of this association has shown that the problems and questions in connection with irrigation in the province of British Columbia are widely different from those in the provinces of Alberta and Saskatchewan, and has also shown that the number of delegates from British Columbia attending the meetings when held in Alberta or Saskatchewan is very small, as is also the number of delegates from Alberta and Saskatchewan when the meetings are held in British Columbia; therefore be it resolved that in the opinion of this convention, it is advisable to form separate associations in the province of British Columbia and in the provinces of Alberta and Saskatchewan, which while remaining affiliated with each other will hold their conventions separately.’

Shortly, the purport of it is that it is advisable to form separate associations in this province, and in the two provinces of Alberta and Saskatchewan. I may say at the outset, that it is not my intention to press this resolution to a vote at this meeting. After discussing that with Mr. Ricardo, we did not think it probably advisable to adopt that course, and therefore we decided that we would ask that the motion stand over until the next meeting of the Association in British Columbia next year, but notice would be given now that a resolution in this shape and along these lines would then be brought up for discussion and for vote; but while I do not intend to press it to a vote at this meeting, still I wish to say a few words on the subject, and give the reasons why we deemed it advisable to formulate such a resolution as this. I may say that I have attended every convention of this Association from its start; I attended the first meeting at Calgary which was the largest and I think the most enthusiastic convention the Association has held yet. I attended the next meeting in Vernon, the next one in Lethbridge and the one at Kamloops last year.

Now, as I have already stated, the first convention in Calgary was very largely attended and was most enthusiastic and it was attended very generally from British Columbia, as well as from the two provinces of Alberta and Saskatchewan. If I remember right there were about 40 delegates or more from British Columbia. I remember very distinctly the fight that took place between Kamloops and Vernon for the honor of the next meeting of the Association, in which Vernon won out. And they had from Vernon and the Okanagan district then a representation, I think, of seventeen. Now, the second convention of the Association was held in Vernon, and at that meeting, if my memory serves me, I don't think there were twelve delegates from the Northwest, from Alberta and Saskatchewan.

The next meeting of the Association was held at Lethbridge two years ago, and at that meeting I don't think there were twelve delegates from British Columbia, in fact I doubt whether there were ten.

At the convention held in Kamloops last year the same condition occurred, and I don't think (Mr. Secretary may correct me if I am wrong) I don't think there were twelve delegates from Alberta and Saskatchewan at that meeting. To-day we have, I find, out of a total number of delegates of seventy-two, fifteen from British Columbia, which is a great improvement on the three previous meetings; at the same time it is a small proportion out of a total of seventy-two.

In talking over with Mr. Ricardo and also with Mr. Palmer, who is a prominent man on irrigation matters on our side of the line, it seemed to us that most of your problems in Alberta and Saskatchewan are very different to what they are with us in British Columbia, and our problems in British Columbia are different to yours; there are certainly a number in which our interests and the questions at stake are very much the same—the same principle involved—but a great number are different, and we do not take the interest in your problems that you do yourselves, naturally; we cannot understand them and we say it is for you, yourselves, to decide—like the question of the university for instance that was brought up this morning; and vice versa, the problems that are most important to us, not concerning you, you have no interest in them; for these reasons it seemed to us that possibly and probably the interests of irrigation, and those interested in irrigation, could best be served by having separate Associations, one in British Columbia, and one in Alberta and Saskatchewan; these two provinces lying close to one another, and your interests and problems being exactly similar, it would be easier for you to hold your meetings here and discuss your problems and so forth, and we would have better attended meetings in that way; it seems rather absurd to hold the conventions alternately one year in Alberta and Saskatchewan, and the next year in British Columbia, and find that such a poor attendance is secured from the other provinces.

Now, if it can be shown that it would be better for us to remain with you, we certainly do not wish to break away from this Association for purely selfish or private reasons, and I am quite sure and willing to admit that as a general principle “union is strength” and more can be accomplished by union associations than by splitting it up into a number of individual separate associations. At the same time it is not intended to break away altogether, because the resolution proposes that we shall still remain affiliated with the central or parent Association, and I think a scheme could be worked out that we hold our separate conventions, that the executives could work together, and whenever deemed advisable or expedient or necessary we could hold a joint convention; or at all events, the executives could meet from time to time, and discuss matters which were of interest equally to all the provinces concerned; they could work together. Probably something on the lines of what Mr. Dennis suggested at the lunch to-day could be worked out, and that while we have our separate convention in British Columbia, from time to time, if deemed advisable, we could hold a joint convention such as Boards of Trade do, and back up the resolutions passed at that meeting by joint action on the parts of the separate associations, and by the action of the body of the association itself.

I think perhaps after consideration and after discussion with my fellow delegates from British Columbia, that the most advisable course to take, is to let this matter stand over for another year, have our convention in British

Columbia in the ordinary course of events, as usual, at such place as this convention shall decide upon, and at that meeting we can then go more fully into this matter and the members of the Association will have had an interval of one year to think over the matter and then decide what is the best course in the interests of all concerned to adopt.

I would like to add to what was said this morning that it struck me very forcibly that what was suggested then was a matter for this Association to consider very carefully and to adopt a line of action along the lines suggested, namely, that the work of the Association should not stop here; should not stop at passing resolutions, we have met now for the fifth time and passed resolutions every time at every meeting, and they have been forwarded of course, but no action has been taken in the meantime; and if the policy of the Associated Boards of Trade were adopted, that this Association and the executive appointed by this convention were to keep at work at these resolutions and try to hammer them home in the interval between meetings of the Association, a great deal more good would be effected than we have been able to effect in the past. With the permission therefore of the meeting, I propose that this resolution stand over until the next meeting of the Association next year. It may have the effect of stirring up the Association somewhat, causing them to think, and perhaps make us more alive than we have been in the last year or two.

CHAIRMAN.—I think the convention will accept the suggestion made by the Hon. Mr. Fulton and let this resolution be withdrawn, and I suppose under these circumstances, that we won't have any discussion on it as the object which was proposed by the resolution is served by bringing it to the attention of the convention.

MR. FULTON.—Might I add, I asked the secretary this morning if he had a copy of the constitution and he informed me that he had not got one and had never seen one. I think there was a constitution drawn up at the first meeting of the Association in Calgary, and it ran in my mind that I drafted that myself, and I think that one article of that constitution was that it could not be amended except by notice given after one convention to be brought up at the next meeting; my intention was not to withdraw the resolution but to move that it stand over until the next year; if that is not in accordance with the constitution, it will be brought up and considered and dealt with then.

CHAIRMAN.—The motion of Hon. Mr. Fulton is that the resolution stands over until the next convention.

MR. GRAHAM.—I am pleased to second that. I am glad Mr. Fulton has decided to hold it over for another year; it may be good, he is certainly one of the most level-headed men we have in British Columbia and we think that nothing but good can come from him, and I think he has seen it in that light. I am very pleased to second the motion.

MR. PETERSON.—I think it might be well if we have time, that we should have an expression of opinion from the delegates on this motion, which is a very important one, and affects more or less the whole organization. I must say that Mr. Fulton's position is well taken, indeed there is no question at all as to that, and as long as we hold the conventions alternately in British Columbia and Alberta we will doubtless be faced with the same state of affairs; however, I think by a

little more energetic work and attending to the preliminaries that we could perhaps improve matters a great deal; but what occurs to me is this, and I think this is the point that should be considered by both parties to the transaction; is there work enough for a convention of this sort to do, meeting annually in British Columbia, and annually in the province of Alberta? The publicity incidental to it is most useful to the principle of irrigation, generally, but it has always occurred to me that if we have practically an Alberta convention one year, and practically a British Columbia convention the following year, that we are able to deal with all the business that comes up, the interests of the different political divisions that are included in our constitution. I think it is well to consider whether an annual convention in each of the provinces would be as well attended and would be as interesting as practically the same annual convention held alternately in Alberta and British Columbia? If it is decided to form a local association, I think part of the scheme should be to hold once every two years, or once every three years, a joint convention, of the associated or the affiliated associations. It strikes me that it might be well if we could get a small committee appointed by this meeting to outline a plan that could be submitted at the next convention making whatever regulations they see fit. The work could be done by correspondence and the thing could be threshed out in that way, and we could arrive at some definite scheme that would be likely to suit all purposes, and I quite agree that as long as we stay as we are it will practically amount to an Alberta convention one year, and a British Columbia convention another year, with a certain number of delegates from the other provinces present. I do not wish to make a motion but I might suggest that we simply have a show of hands as to whether that procedure appeals to the meeting. Even if the chair nominated a small committee—while the executive met the next time with a definite scheme. I think all these things ought to be in the hands of the delegates each year. We certainly must get electricity into the meetings or we will die.

SECRETARY.—Some reference has been made to the associated Boards of Trade of which I happen to be secretary. One of the reasons why we were not able to take up an active follow-up system is simply that we did not have the material to work on. For the first six or eight months after I received the appointment, I practically financed the thing myself before I received from Mr. Fairfield \$75. This was afterwards augmented by a balance of \$22 some odd. I wish to say that we have no source of revenue and heretofore any grant made by the provincial government has been made to the local committees, so that we were not in a position to take up a follow-up system because we have got a little money on hand. Mr. Peterson has \$1,000 which was very generously donated by the provincial government of Alberta, and I received through the efforts of Mr. Fulton some \$900 of which we have some \$800 yet; so that we appear to be in a better position every convention, and there appears to be a disposition on the part of the various provincial governments to grant us some little assistance. I think if we could get some way of augmenting these funds we could inaugurate a good follow-up system, but "you cannot make bricks without straw."

CHAIRMAN.—Anybody else wish to speak to the motion? Are you ready for the question? All in favor of the motion made by Mr. Fulton that this matter stand over until the next convention please signify in the usual way? Carried.

All in favor of the suggestion made by Mr. Peterson that there shall be an instruction to the executive committee to take the matter into consideration themselves outlining a scheme for presentation at the next convention?

MR. PETERSON.—I make the definite motion, that the executive committee be instructed to take the matter in hand and report.

Seconded by Mr. Cordy.

Motion carried.

CHAIRMAN.—I have now much pleasure in calling upon Prof. Etcheverry to read his paper.

PROF. B. A. ETCHEVERRY.—I want to thank the Association first for asking me to come over here. I did not have much time to prepare my paper, in fact I had to prepare it between eleven o'clock and midnight, so it may not be quite as good as I want it to be.

PUMPING FOR IRRIGATION IN BRITISH COLUMBIA.

B. A. ETCHEVERRY.

During this summer and last summer it has been my privilege to visit several of the irrigated districts of British Columbia, and I have observed with interest the character of your water supplies and its relation to irrigation.

The irrigable land is situated as separate small valleys formed on both sides of creeks, or in benches high above your splendid large rivers. While there is an abundance of water in these rivers such as the Thompson, the Fraser, the Kettle valley and in your large lakes of the dry belt, these sources of supply although adjacent to irrigable land are practically not available for gravity irrigation, because of the considerable height of the main benches of land above these bodies of water and the very flat grades of the river which make the diversion directly from these sources an economical impossibility.

For these reasons it has been necessary to utilize the creeks. These creeks have a very irregular flow, the supply is abundant during the beginning of the irrigation season, but in many cases diminishes to an insufficient flow before the close of the season. In most of the water sheds of the streams, storage reserves can be constructed at a moderate cost and will help to regulate the flow.

Up to the present the natural stream flow in some cases supplemented with storage water has been the usual source of supply. Naturally the most easily constructed systems were installed first and the best available sources have been taken up. With the increasing demand for water to put new land under irrigation, less favorable sources of water must be utilized, and the cost of development will become greater. There will still remain bodies of land for which no gravity water is available, and which may be situated not too far above a lake or river. For these conditions, that is, where the cost of development of gravity water is excessive, where there is no gravity water available and where the conditions for pumping are favorable, the cost of pumped water may compare favorably with that of gravity water.

For these reasons, I have chosen this subject for my paper, which while it may not be of interest to all those here will I hope be of value to representatives of British Columbia.

In the installing of a pumping plant the factors to be considered are the size and types of the pump and engines, the kind of fuel, the cost of installing, and the total annual cost of operation. It is not my purpose to go into the details of the design of a pumping plant, but to take up a few of the fundamental points which should be considered before installing a plant.

The discharge capacity of the pumps will depend on the area irrigated, the duty of water or depth of water required on the land, and the period of operation. On some lands a total depth of 12 inches of water during the irrigation season, will be ample for young orchards. For a full bearing orchard not over 18 inches should be sufficient, while for alfalfa and other forage crops 24 to 36 should be ample. To put a depth of 2 feet of water on one acre, it takes a flow of very nearly one cubic foot per second for twenty four hours. This is equivalent to 450 U.S. gallons per minute for twenty four hours. This relation can be applied to any case to obtain the size of the pumps. For example, if it is desired to irrigate a 40 acre orchard 2 feet deep in an irrigation season of 120 days, this requires 80 acre feet in 120 days, or two thirds of an acre foot per day, this will be obtained from a pump giving one third of a cubic foot per second, or 150 gallons per minute, when the pump is operated continuously. There are however, many disadvantages to operating a pump continuously especially for a small tract.

1st. Continuous operation requires either continuous irrigation or the construction of a regulating reservoir.

2nd. A small plant is less efficient and requires a proportionately larger fuel consumption than a large plant.

3rd. It is often more difficult to irrigate with a small stream than with a larger one.

For this reason it is seldom that it is desirable to have a small pumping plant operated continuously. Usually it is preferable to make the period of operation one half or one third of the irrigation season, and use a pump two or three times the size required for continuous irrigation. By combining with a neighbor it may be possible to have the use of a pump in rotation and operate it continuously.

The size of the engine depends on the size of the pumps, the kind of pumps and the lift. It is therefore affected by the factors on which the size of the pumps depend. The disadvantage of not operating continuously is that the first cost of installation is greater, and that where electric power is available it may not be possible to obtain it at a meter rate, but at so much a horse power per season, in which case it is desirable to use a small sized plant making the period of operation as long as possible, but where the charge for electric power is based on the quantity actually used, or when a gasoline engine is used, it is preferable to shorten the period of operation, specially for small tracts.

The type of pumps to be used depends on the discharge required and the height of lift. Deep well pumps and air lift pumps are used for pumping from deep wells, and for the present need not be considered in British Columbia. Hydraulic rams are used for small quantities of water, such as for domestic purposes on small farms. They require a nearby stream with sufficient fall in a short distance.

For pumping water from lakes or streams the two most common types of pumps are the centrifugal pumps and the plunger pumps. Simple centrifugal pumps are best adapted to discharges above 200 gallons per minute and for lifts under 75 feet, compound centrifugal pumps may be used for the lifts of 200 feet or more. Plunger pumps are best adapted for high lifts above 100 feet. The efficiency of the commercial centrifugal pump when installed often falls below the manufacturers' guarantee, and a properly installed centrifugal pumping plant is usually about 50%. The efficiency of a high class plunger pump when properly installed is about 90%.

The engines may be either gasoline or steam engines or electric motors. When electric power can be obtained at a reasonable cost even though it be a little higher than the fuel cost of either gasoline or steam, it is preferable because of the lower cost of operation and maintenance.

For small plants and where the fuel cost of gasoline is not much in excess of the fuel cost of steam a gasoline engine is preferable. Steam engines require the service of a licensed engineer and his salary alone for a small plant irrigating ten to 40 acres may be the largest item of cost. Steam engines are preferable where coal is cheap and for large plants. It can also be used to advantage where several small pumping plants are to be installed not far from each other. In this case the steam engine is used to generate electric power at a central station and the power is transmitted to the electric motors operating the individual pumping plants. In any case, after all the above factors have been considered, the selection must be made on the basis of cost.

The cost of a pumping plant includes in addition to the manufacturer's price of engine pumps and accessories, the foundation, the building to house the plant, and the labor of installation. A complete erected centrifugal pumping plant either steam or gasoline should not exceed \$100 per horse power, for a ten horse power engine, \$75 per horse power, for a 20 horse power, and \$60 per horse power, for a 50 horse power plant. An electric plant should be erected for two-thirds of the above cost.

Annual cost of pumping: The annual cost of pumping includes fuel cost, cost of attendance, and fixed charges. Fuel cost—from a large number of tests of pumping plants in Southern California it has been found that the efficiency of a well installed commercial centrifugal pumping plant will usually not exceed 50%, when allowing for friction in pipe, valves etc. Where plunger pumps are used the plant efficiency may be as high as 90%.

To raise one acre foot of water one foot high, assuming a 50% plant efficiency, will take two kilowatt hours or about one third of a gallon of engine distillate or 13 lbs. of coal. Based on these figures and assuming the following cost:—electricity, 3 cents a kilowatt hour; coal \$6 a ton; engine distillate, 22 cents a gallon; the fuel cost for one acre foot of water lifted one foot high is six cents for electric power, seven and one third cents for gasoline, four cents for steam engine.

Attendance: An electric motor requires a minimum of attendance; small gasoline plants require little attendance but are not always reliable; steam engines require a licensed engineer. For small plants the cost of attendance for an electric motor should not exceed five cents per hour, for a gasoline engine, ten cents per

hour, and for a steam engine 40 cents per hour. The cost of repairs will not exceed one and one half per cent of the cost of the plant for a gasoline or steam plant, one per cent for an electric plant.

Fixed charges.—The fixed charges, assuming 6% for the interest on money invested, 12% for depreciation of a steam or gasoline plant, and 10% for depreciation of an electric plant, will give a total of 18% for the gasoline or steam pumping plant and 16% for the electric motor pumping plant.

By assembling the above items of cost a fair estimate may be obtained of the cost of installation and the annual cost of pumping. For example, if it is proposed to pump 100 feet high to irrigate a 40 acre tract 6 inches deep each month for four months by operating the pump one third of the time, it would require a 40 horse power pumping plant which would cost not over \$2,000 or about \$50 an acre. The annual cost of pumping per acre at the price assumed above would be for the gasoline plant, \$14.66 for fuel, \$2.40 for attendance, 75c for repairs, \$9 for fixed charges or a total of \$26.80; for an electric motor the items are \$12. for power, \$1.20 for attendance, 50 cents for repairs and \$8 for fixed charges, or a total of \$21.70 per acre. For the steam engine plant the total cost would be \$27.35.

From the above example it is seen that the fuel cost is only about 50% or less of the total cost, for lower lifts the proportion of fuel cost to total cost would be less; while for higher lifts the proportion would be greater, and it would be economy to use a more efficient plunger pump, although the first cost of installation may be greater.

The first cost of installation and fixed charges could be made lower by using a smaller plant and operating continuously, but this would be partly balanced by increased cost of attendance and increased fuel consumption.

The above estimated cost of about \$25 an acre for the annual cost of pumping two acre feet of water 100 feet high, or about 12 cents for an acre foot lifted one foot high, is a fair estimate for plants under somewhat similar conditions. This cost of water may seem high as compared to gravity water but to obtain an idea of the feasibility of developing water by pumping, comparisons must be made with the value of irrigation water in the irrigated districts of British Columbia, and also in other similar districts. In British Columbia up to the present, water obtainable by gravity without pumping has been plentiful; for that reason pumping has not been necessary and very few pumping plants have been constructed. However, water is becoming more scarce and valuable and the steps which many irrigation companies in British Columbia and Washington are taking to conserve water and prevent all losses by carrying it in canals lined with concrete and in pipes constructed at a great expense show that water has become sufficiently valuable to justify pumping.

Making a comparison first with water thus obtained we find that the cost of construction of a well constructed system will go to \$50 or \$60 an acre, and even higher. The Trenton project in Eastern Washington constructed by the United States Reclamation Service cost \$93 per acre. The Umatilla project in Eastern Oregon also constructed by the Reclamation Service cost \$60 per acre. Other systems installed or being installed in British Columbia, will cost over \$60 per acre. The big advantage of gravity systems is that the annual cost of operation is small,

usually less than \$5 per acre, but if to this the interest on the cost of construction and the depreciation be added, the total annual cost of gravity water may be over \$10 per acre.

A more interesting and valuable comparison is obtained by considering pumping plants in other districts. In Eastern Washington water is now being pumped through lifts of 250 feet. In the citrus districts in California, lifts above 200 feet are not unusual, and it is considered profitable to pump 460 feet. The cost of pumping water in the Pomona district of Southern California will average \$15 per acre for one acre foot delivered by irrigation companies, while for smaller private plants the cost is often far greater. In 1905, the United States Department of Agriculture made tests which show that the cost of pumping at private plants of 10 to 100 horse power with lifts 100 to 300 feet varied from \$10 to \$90 per acre of water 12 inches deep. Of course there is a limit beyond which it is not economically feasible. In the California citrus districts lifts above 400 feet have been profitable, for the orchard lands of British Columbia equally high lifts should be profitable, for the net return per acre from a good apple orchard is usually more than that from a citrus orchard.

A citrus orchard ten years old should give a profit of \$100 to \$150 per acre, the net profits from apple orchards ten to twelve years old in the Yakima Valley are given in United States Government Bulletins as \$200 to \$600 per acre.

With profits larger than those obtained from citrus orchards in Southern California what has been considered feasible in pumping there is much more so for the apple orchards of British Columbia, when no other more economical source of supply is available.

CHAIRMAN.—This paper is now open for discussion or for any questions.

Mr. CORDY.—Do I understand you to say that foot second would cover an acre a foot deep in one day?

Prof. ETCHVERRY.—A cubic foot per second will give two acres one foot deep; one cubic foot per second means a cubic foot each second; in a day there are 86,400 seconds, and one acre is 43,560 feet.

CHAIRMAN.—This question of a pumping plant is one of great importance and I am sure one of considerable interest; I am sure the professor will be pleased to answer any questions that might be addressed to him in regard to the subject, and the members of the convention, some of whom I have heard discussing the matter privately, ought to take the opportunity of learning all they can in regard to it. I am quite prepared to allow the convention to discuss it, particularly as it seems to be a matter that wont be turned over to the government officials to be worked out.

Mr. PETERSON.—What would be the possibilities of a pumping plant with only gas available—natural gas—available, where the crops would be simply the ordinary farm crops of alfalfa and grain?

Prof. ETCHVERRY.—Do you mean where you could obtain natural gas to operate your engine? Of course that would just about cut the cost which I have given in half, probably; that is, if you could get your fuel for practically nothing, still you would have your plant which would be just as expensive, then the cost of maintenance and attendance, and so forth; of course, for a large plant the figures which I have given would be much less; the cost I have given is simply for

the pump with an engine; by using a plunger pump you could get about 90% efficiency, you could cut the fuel cost perhaps to one half, and also if you have a steam engine your fuel would be much cheaper than it would be for gasoline and it would be necessary in a case like that to have a man operate it continuously, a licensed engineer, or you might need two if you were operating twenty-four hours a day, or three; and in that case it would be very much diminished, that means you have to get more expensive machinery, the ordinary commercial pump is not very efficient; in fact I believe to pump 200 acres the cost would be almost cut in two.

MR. PETERSON.—Oh, I am referring particularly to a large scheme controlling its own gas well and serving a large number of acres, where the crops that could be grown under the climatic conditions here, would probably justify the cost.

PROF. ETCHEVERRY.—We usually do not consider it profitable to lift over about 60 to 70 feet for alfalfa; that is with the prices obtained in the valley.

MR. PETERSON.—What power have you?

PROF. ETCHEVERRY.—In southern California they use motors and gasoline engines.

MR. MUCKLETON.—What do you consider the equivalent in gasoline of 1,000 cubic feet of natural gas if it was 50% methane?

PROF. ETCHEVERRY.—I could not tell you.

MR. FAIRFIELD.—What effect in so far as deterioration is concerned, does the riliness in the water have?

PROF. ETCHEVERRY.—It would not affect the pump if you used a centrifugal pump.

MR. FAIRFIELD.—Even in fairly high lifts?

PROF. ETCHEVERRY.—In a case like that it would be better to use a centrifugal pump than it would to use a plunger pump.

PROF. ELLIOTT.—I would like to know if anything has been done along the lines of harnessing the stream itself to do the pumping?

PROF. ETCHEVERRY.—In some places, for instance in Pascoe, in the lower part of the Yakima valley, they develop the electric power that way and use the electric power for pumping. Of course you do not always have the conditions for that. In British Columbia it might be possible on some streams to develop a power for a smaller stream which has a rapid fall, and perhaps use that for pumping, but usually the cost of installation will not justify it for a small pumping plant. There is of course, a danger of people going to extremes and using too many pumping plants, and for too high lifts, which the country is not ready for.

MR. STOCKTON.—I just want to call attention in this connection, to a very economical system of pumping for irrigation which has been devised by the United States Reclamation Service in the northern district and it might be applicable in other cases. Wherever a gravity system or a stream could be conducted to a point where there is a certain head of developed power, as in gravity canals very often a drop of line is necessary—that water could be dropped through a vertical turbine with a centrifugal pump on the same shaft enclosed in a casing, and a certain proportion of the total water lifted to a determined height above the main canal or the power supply canal—that scheme has been worked out in the Huntley project in Montana, and with very great success; the cost of the machinery is con-

siderable but the cost of operation and maintenance is very small, and as the water supply for irrigation occurs at the same season as the use of the few plants, of course it is identical.

CHAIRMAN.—It was expected that Mr. Martin Burrell, M.P., would be here this afternoon and address the convention, but he has not yet arrived; he may come in later. The general business of the convention is concluded with the reading of the last paper, and the matters that remain for consideration are generally formal matters of business. They are, the next place of meeting, the election of officers, the arrangements about representation at the International Irrigation Congress at Chicago; and any other items of special business that may come up, and such being the case I think the time has arrived for the president to resume the chair at this convention. I did not see any very good reason why he should not have stayed in the chair right along, but I must thank the convention for the honor done me in putting me in the chair; it has always been a very great pleasure to attend the sessions of the irrigation convention, and to listen to the papers and the discussion. It is an education to any person who attends, and quite an inspiration in trying to work out the administration in connection with irrigation matters. It would almost be concluded from what has been said to-day, that the convention has not accomplished anything up to the present time; probably the convention has not accomplished—undoubtedly has not accomplished, all that it might have done, but its work has not been altogether unprofitable; I think that it is the work of this convention that has enabled us to make such advances as we have made. I very well remember one particular thing that this convention passed upon that involved some expenditure by the Dominion government, and it was brought to the attention of the head of the department, and immediately on my submitting the proposal on the lines of the resolution of the convention it was passed. Now, if I had submitted that proposal without the resolution of the convention having come in beforehand, I am not so sure it would have passed, in fact I rather think it might have been deferred until some more convenient season, the way, unfortunately, many of our proposals go; and I feel that a convention such as this is an absolute necessity for any work like this that is developing.

I do not think that the eastern part of the Dominion of Canada really understands or appreciates the west—it does not appreciate the size of it—it does not appreciate the expense that is necessary in order to carry on any work in this great far-stretching country that we have in the western provinces. And I think it is up to the west to see to it that they make noise enough that the east will understand that they are here, and they are going to get what they want in that respect. It is going to take a considerable expenditure by the government to do the work that should be done to assist in the development of this western country. I don't think that the expenditure that is necessary is at all appreciated, but we have immediately and in the next few years, to make a very considerable expenditure if we are to keep up with the needs of the development of this western country. It was all very well a few years ago when this country was largely unsettled, when the demands of the population were small and when the natural resources were abundant and plentiful in every way for all the needs of the people that were here; but the situation is changing and is changing every day, and changing so rapidly that only the most strenuous exertions will keep us abreast of it, and it is impor

tant that the government departments that have the administration of matters in the west should be so equipped with men, and should be so equipped in other ways, that they may keep abreast of this development, and keep ahead of it, so as to give the information that is required to carry it out in the right directions.

I think that the follow-up system, suggested by Mr. Dennis, if it could be carried out, will be a great additional help, and I sincerely hope that the convention may arrange to carry it out.

I do not want to detain you by talking further, but I have to thank you again for having placed me in this position for this convention, and I resign the chair to the president.

MR. PETERSON in the chair.

Moved by Mr. Wooliston, Seconded by Mr. Cordy.

‘That the convention be held at Kelowna, B.C., next year.’ Carried.

Moved by Mr. Hutchings, Seconded by Prof. Elliott.

‘That a delegation be appointed to go to the National Irrigation Convention at Chicago—five delegates.’ Carried.

The following delegates were then nominated: Messrs Dennis, Agur, Fairfield, Cordy, Elliott. Substitute delegates: Messrs R. M. Palmer, W. C. Ricardo, C. W. Peterson, A. S. Dawson.

The following officers were elected.

OFFICERS.—Hon. President, Hon. T. W. Patterson, Lieut.-Governor, British Columbia.

President: Hon. W. R. Ross, Minister of Lands, B.C.

First Vice President: J. S. Dennis.

Second Vice President, R. H. Agur.

Treasurer: P. Dumoulin.

Permanent Secretary: Norman S. Rankin.

Moved by Mr. Agur, Seconded by Mr. Elliott.

‘That the number of the executive committee be increased from six to eight.’ Carried unanimously.

EXECUTIVE COMMITTEE.—Messrs. F. J. Fulton, Wm. Pearce, E. M. Carruthers, J. W. Elliott, W. C. Ricardo, R. M. Palmer, W. H. Fairfield, C. W. Peterson.

MR. PETERSON.—We have received a very generous grant from the government of the province of Alberta. I think the thanks of the Association should be sent to them.

MR. FULTON.—I have much pleasure in moving that the thanks of the Association be forwarded to the government of the province of Alberta for the contribution. Seconded by Mr. Hervey. Carried.

SECRETARY.—I think thanks are also due to the British Columbia government for the unexpended balance held from the last convention which was kindly procured for us through the efforts of Mr. Fulton; and I think the vote of thanks should be conveyed, not only to the government, but also to Mr. Fulton for his efforts in that direction.

Moved by Mr. Fairfield, Seconded by Mr. Muckleston,

‘That a vote of thanks be voted to the government of British Columbia, for assistance given to the objects of the Association, and also to Hon. Mr. Fulton for his efforts in that behalf. Carried.

MR. GRAHAM.—I would like to move a vote of thanks to the city of Calgary and the Board of Trade for their welcome.

CHAIRMAN.—It has been moved that a vote of thanks be tendered to the civic authorities and the Board of Trade of the city of Calgary for their entertainment of the Association delegates, and also to the speakers, all that have addressed the convention. Carried.

MR. AGUR.—I think the idea of attending the Irrigation convention at Chicago is good. The chairman of the Association made the statement it was the finest exhibition they had had. In their, I think it was the 18th congress, last year—the exhibition of fruit did not compare with the local exhibition of fruit made at Summerland last year alone; so the province of Alberta and our own province of British Columbia have a great opportunity to take advantage of the situation—the management of the Association or congress admit of these exhibitions being made, so I think it is a matter for the executive. It will be on a very large scale, and the expenses were borne by the city of Chicago, the entertaining alone will cost them \$50,000. It is on a very elaborate plan.

MR. MARSHALL.—I would like to know whether any fruit can be shown at that convention that is not grown on irrigated land?

CHAIRMAN.—I think not.

Moved by Mr. Hutchings, Seconded by Mr. Graham.

‘That the convention be finally adjourned.’ Carried.

WEDNESDAY EVENING SESSION.

On Wednesday evening, an illustrated lecture was delivered by Mr. A. S. Dawson, Chief Engineer in charge, on,

“THE CANADIAN PACIFIC RAILWAY COMPANY’S IRRIGATION PROJECTS IN THE PROVINCE OF ALBERTA.”

Mr. Dawson said:—

Mr. Chairman and gentlemen of the fifth Western Canada Irrigation Convention:

I appreciate the privilege given me of addressing you for a short time on the Irrigation Projects of the Canadian Pacific Railway Company, in Alberta. It is a business enterprise, which has naturally received a large amount of publicity; and I trust you will bear with me, if at times, certain facts, incorporated in my paper, may have already appeared in print. It is a broad subject, and many interesting and instructive papers could be prepared, each dealing with some specific subject, or descriptive of some of the more important structures being built. My aim at this time, however, will be to give you a general idea of the work as a whole, without entering into engineering details; and the paper will be followed by a series of lantern slides.



Bird's eye view of the C.P.R. 3,000,000 acres Irrigation block,—showing details of canal and ditch construction in Western and Eastern sections.

Supplying moisture to desert and semi-arid lands by artificial means is no new thing in the enterprises of civilization, and has been practiced on one portion or another of the globe since the dawn of history.

It was practiced by the Egyptians, Arabians and Assyrians many centuries past; and history records that the flood waters of the Nile were used to irrigate its valleys many hundreds of years ago. The Romans operated vast systems, which are in use at the present time; and the Chinese are credited with having put water on their rice lands by artificial means several centuries before the Christian era.

This ancient art had its origin in America in prehistoric times with the Pueblo Indians, who inhabited what are now portions of New Mexico and Arizona.

Mormons settling on the shores of Great Salt Lake were the first English-speaking people to make a systematic application of the principles of irrigation in Western America; and this was shortly followed by the use of ditches in California, originally constructed for placer mining. The results obtained therefrom soon induced settlers in the states of Idaho, Washington, Oregon and Wyoming to resort to similar means in the cultivation of their crops. This was followed by large private enterprises; and by the passing in 1902 of the Reclamation Act by the government of the United States. This vast enterprise, under the direction of the Secretary of the Interior, has now either in operation or under construction projects involving an expenditure of over \$60,000,000; and has undertaken to complete 35 projects, to serve 3,200,000 acres of land, at an estimated cost of \$145,000,000.

The extent to which irrigation is practiced to-day is oft-times overlooked; amounting as it does to 53 million acres in the Indian Empire, 8 million acres in Egypt, 5 million in Italy, 3 million in Spain, 15 million in the United States, with smaller areas in China, Japan, Australia, France, South America, and elsewhere.

The works providing for the irrigation of these vast areas represent an investment of over one billion dollars; and produce annually crops valued at over that amount.

Irrigation in Southern Alberta may be said to date from 1892, when a series of dry years turned the attention of the settlers to the possibility of aiding the growth of their crops by the artificial application of water. The question subsequently assumed such importance as to warrant its being taken up by the government; with the result that well-considered and comprehensive laws relating to the use of water for irrigation were passed; a system of general surveys undertaken to determine the source and value of available supplies; and the location of the areas where such water could be used to best advantage.

These surveys shewed that three extensive areas offered special advantages for irrigation; one containing some 250,000 acres, situated in the Lethbridge district, which could be supplied from the St. Mary's river; a second containing about 350,000 acres lying near the Junction of the Bow and Belly rivers, in townships 11 to 14 inclusive, ranges 11 to 16 inclusive; and a third, a much larger one, situated along the main line of the Canadian Pacific Railway, and extending about 150 miles east of the city of Calgary. It is interesting to note that the works to serve all of these tracts have either been built, or are now under construction.

It is the last mentioned project that this paper deals with specifically.

This tract of land eventually passed into the hands of the Canadian Pacific Railway Company, and is now known as the Bow valley Irrigation Block. It was conceded that its development and colonization along proper lines would add materially to the selling prices of the land; would do away with the uncertainty of getting sufficient moisture for certain crops in certain years; would admit of intensive farming on smaller areas; and would result in settlers being attracted in greater numbers than could otherwise be expected; all of which are the basis of the revenue-producing value of any agricultural country as far as traffic receipts are concerned.

The Bow river heads, as you are aware, in the Bow lakes on the eastern slope of the Rocky Mountains; and with its tributaries has a drainage area of about 3,800 square miles at Calgary, and about 5,100 square miles at Bassano. It generally reaches its highest stages between June 15th and August 15th of each year, and its lowest stages during January and February. Its maximum flood discharge at Calgary has probably been close to 100,000 second feet, although the hydrographic records for both extreme high and low water are rather meagre.

The Block is an open prairie plateau with a general elevation of about 3,350 ft. above sea level at its westerly limits, sloping gradually until a general elevation of about 2,300 is reached at its easterly boundary. Its topography is rolling, particularly in the western portion; whereas large areas of almost level plains are found in its easterly limits. The soil is good, consisting of a heavy black loam and clay subsoil in the westerly portions; and a lighter sandy loam of great depth overlying clay and hard pan in its easterly limits.

It is bounded on the west by the Fifth Meridian; on the south by the Bow river; on the east by the line between ranges 10 and 11, west of the Fourth Meridian; and on the north by the Red Deer river and the north boundary of township 28. Its length east and west is about 140 miles, and it has an average width north and south of about 40 miles. It is intersected by the main line of the railway company, and numerous other railway facilities are being provided in various directions. It contains an area of 4,840 square miles, or 3,097,580 acres.

The precipitation varies considerably from year to year, and decreases easterly as the altitude becomes lower. Meteorological records only exist subsequent to 1886, and are only applicable to the westerly portion of the Block. The average annual precipitation at Calgary between 1886 and 1910 was 15.15 inches; the minimum for the same period being 5.90 inches in 1889, and the maximum for that period 31.90 inches in 1902. The average for the irrigation period of five months, from May 1st to October 1st, covering the same years, was about 11 inches.

This moisture, however, is not always available when most needed; and it is a recognized fact that without irrigation certain crops cannot be raised to advantage; and that in any year the certainty of crop production with large yield can only be assured by artificial means.

Surveys in connection with the project were commenced by the railway company in 1903, and have been gradually extended in detail since that date. As you may understand, this represented a vast amount of work; as an irrigation project demands surveys and examinations far more complete than those for a railway

line. Elevation is the controlling feature; and lateral extent or width of country is as important as length; and width, length and height have all to be considered.

Accurate topographical surveys have been carried on by plane-table methods over practically the whole Block at an average cost of about ten cents per acre, on which the complete system has been projected.

On the completion of the preliminary surveys it became evident that the Block naturally divided itself into three sections, which were designated as the western, eastern and central, of about one million acres each; and the work is being carried on along the lines of development in the order named. The western and eastern sections are complete units in themselves, whereas the central section, owing to its general elevation, could only be served by an enlargement of a portion of the trunk lines in the western section.

Western Section.

The western section comprises an area of 1,039,620 acres, of which about 370,000 acres have been brought under ditch. Construction was commenced in 1903 and completed in 1910, and water was first used in 1907. Water for this section is diverted from the Bow river at a point near the present easterly limits of the city of Calgary. The head works are of timber, and are well protected by a pile and timber wall along the river bank, extending 350 feet above and 1,400 feet below the structure. Their sill elevation is 3,353, and they consist of 20 openings, three feet wide and ten feet high, subject to side and top contractions. The gates are wood, of the straight lift type, and are operated by rack and pinion through a triple reduction gear with a power ratio of 100 to 1, arranged on a moveable winch mounted on a travelling truck. It is the intention to replace this structure in the near future with permanent works; and at the same time to build a collapsible dam in the river which will admit of obtaining the full head of about ten feet required, during all stages of the river.

Main canal "A" heads at this structure, its capacity being 2,000 cubic feet per second at full supply of ten feet. Its section varies to suit conditions, its maximum section being 60 feet bed width, 120 feet at the water level, with 3 to 1 slopes, and a grade of .01 per cent. Throughout the greater portion of its length its dimensions are 44 feet bed width, 84 feet on the water line, with 2 to 1 slopes, and a grade of .02 per cent; which, with an assumed value of $n=.025$ gives a calculated discharge of 2,050 cubic feet per second. At a point about $2\frac{1}{2}$ miles below the headgates, this canal was crowded close to the river banks by heavy excavation, and at this point a set of escape or regulating gates was provided, with sill elevation one foot below canal grade. This structure is of timber, and consists of four openings 6 ft. by 11 ft. each controlled by wooden gates. These are known as balanced pressure gates, and are so designed that they will rise of their own accord when the head against them is about 5 feet. Each consists of a rectangular barrier working freely between parallel walls without guides. Each gate is hinged to four long arms arranged in pairs, the location of the hinges being so chosen that the weight of the gate is balanced by any required pressure. They are made practically watertight by rubber flashings, and are lifted by an ordinary chain windlass provided with pawl and brake.

At a point about 15 miles below the headgates, the main canal makes a vertical drop of ten feet, where an important timber structure was built. The excessive velocity resulting from this drop was taken care of by the contraction of the opening above to 25 feet, and by a water cushion 5 feet deep below, with an enlargement of the opening to 43 feet terminating in wings. Piling was extensively used in this and all other important structures built in the early stages of the project.

About two miles beyond this point, or 17 miles from the headgates, this canal terminates in reservoir No. 1, which, however, is in reality only a balancing pool with slight storage for sudden drafts of water; thus relieving the secondary canals from small fluctuations in head. The reservoir referred to, which is about three miles long and half a mile wide, was formed by the building of an earth dam 2,000 feet long, with a maximum height of 30 feet, faced with heavy rip-rap on the water side.

From this reservoir the water is taken out in three secondary canals, known as "A," "B" and "C," having a combined length of about 250 miles. These are each controlled by timber headgates with sill elevation of 3,321.50, and are of a type similar to those described in connection with the main canal spillway.

Numerous large structures are located on all of the secondary canals, including headgates, drops, flumes and bridges.

Secondary canal "A" heads out from the south end of reservoir No. 1, and secondary canal "B" and "C" together are taken out at the north end. Secondary canal "A" at its outlet is 18 feet bed width, carrying 8 feet of water, with 2 to 1 slopes, on a grade of .03 per cent.

It drops twice to cross the railway line; and about 15 miles from its head again drops about 30 feet and expands into what is known as reservoir No. 2; at which point its section was changed on account of grade to 22 feet bed width, carrying 6 feet of water, with 2 to 1 slopes, on a grade of .035 per cent. About 30 miles beyond, near Strathmore, it again drops and crosses the railway line, splitting into a north and a south branch. North "A" is 10 feet bed width, carrying 3.2 feet of water, with 1 to 1 slopes, on a grade of .06 per cent. South "A" is 18 feet bed width, carrying 4½ feet of water, with 2 to 1 slopes, on a grade of .04 per cent. Both continue easterly to the vicinity of Gleichen, covering lands to the Crowfoot creek at an elevation of about 2,970.

Secondary canals "B" and "C" together utilize a natural channel for three miles from the north end of reservoir No. 1, and there divide, "B" turning easterly and "C" northerly. "B" is 28 feet bed width, carrying 6 feet of water, with 2 to 1 slopes, on a grade of .025 per cent., continuing for four miles to split gates dividing it into a north and south branch. "C" is 40 feet bed width, carrying 6.4 feet of water, with 1½ to 1 slopes, on a grade of .03 per cent., and serves all the land lying between the Rosebud river and the Serviceberry creek. At a point about eight miles from its upper end it splits into an east branch—which is 37 feet bed width, carrying 5 feet of water, with 1½ to 1 slopes, on a grade of .035 per cent.—and a west branch, which is 12½ feet bed width, carrying 5.7 feet of water, with 1½ to 1 slopes, on a grade of .04 per cent. The east branch utilizes about ten miles of natural channel, in which 175 feet of grade is disposed of. The west branch crosses the valley of the Crowfoot creek by a wood stave pipe siphon of 53 inches internal

diameter and 1,600 feet long, working under a maximum head of 82 feet, in which 8 feet of grade is used up.

Exclusive of the main canal, secondary canal "B" north branch is the most important waterway in the western section, as it is intended ultimately to be used for the main supply channel to the central section of the Block. After leaving the junction of its north and south branches, it follows a natural channel for about 16 miles, this channel being straightened in places by artificial cut-offs. In this distance it falls about 250 feet, the elevation of the split gates being 3,284 and of the headgates at the lower end of the natural channel, known as Weed creek, being 3,031. At the dam on this channel the canal heads out 18 feet bed width, carrying $4\frac{1}{2}$ feet of water, with 2 to 1 slopes, on a grade of .045 per cent., and extends a distance of 14 miles to a summit with an elevation of 2,998. Before crossing this summit one branch is taken off to serve lands in the vicinity of the south branch of the Crowfoot creek. After crossing the summit it again splits; the main branch continuing on the north side of an elevated ridge until Summit lake is reached, which is the controlling point for the central section of the Block, and where a broad low valley of about elevation 2,884 will be crossed by a siphon.

From the secondary canals the water is again taken out, and distributed through a comprehensive system of distributing ditches, which bring it to each parcel of land to be served.

In the western section of the Block the following mileage of canals has been constructed:—

	Miles.
Main canal.....	17
Secondary canals.....	254
Distributing ditches.....	1329
Total.....	1,600

and in addition to the above there are several hundred miles of small ditches constructed by the farmers.

The structures, consisting of headgates, spillways, drops, flumes, bridges, etc., are numbered in thousands; and in their construction 10 million feet board measure of timber, and over four thousand cubic yards of reinforced concrete were used.

In constructing the system in the western section over 10 million cubic yards of material was excavated. Practically all the work was carried out under contract at prices ranging from $12\frac{1}{2}$ cents to 43 cents per cubic yard; the latter price including overhaul on the heavy work. The average price was about $17\frac{1}{2}$ cents per yard. The cost of timber work in place has been slightly over \$55 per thousand feet; and of reinforced concrete about \$23 per cubic yard; both figures including all material used as well as excavation, trenching, and backfilling.

Central Section.

This section contains 901,740 acres, and it was at first contemplated to irrigate about one quarter of this area. Detailed surveys, however, shewed that the

cost of serving such an area would be excessive, and at present it is not contemplated to serve more than about 75,000 acres of this section, with an elevation at its westerly boundary of about 2,940.

As previously intimated, this section could only be reached through an enlargement of a portion of the trunk system already constructed to serve the western section of the Block; and due consideration has been given this matter wherever possible by spreading double banks far enough apart to admit of carrying the additional amount of water which will be required.

Up to date the construction of this portion of the system has not been started.



Horse Shoe Bend Dam (Eastern Section) General view, looking south east.

Eastern Section.

The eastern section of the Block contains 1,156,220 acres, of which 440,000 acres are to be rendered irrigable. Most of the land is of a gently rolling character and susceptible to good drainage. The soil for the most part is a rich sandy loam overlying hard pan and shale at various depths.

The idea of the peculiar topographical conditions existing in this section is necessary before the scheme as worked out can be understood. The main watershed of the country between the Bow and the Red Deer rivers starts, as far as this section of the Block is concerned, at a point on the Bow river locally known as

the Horseshoe Bend, about three miles south-west of Bassano, a station on the main line of the Canadian Pacific Railway 83 miles east from Calgary.

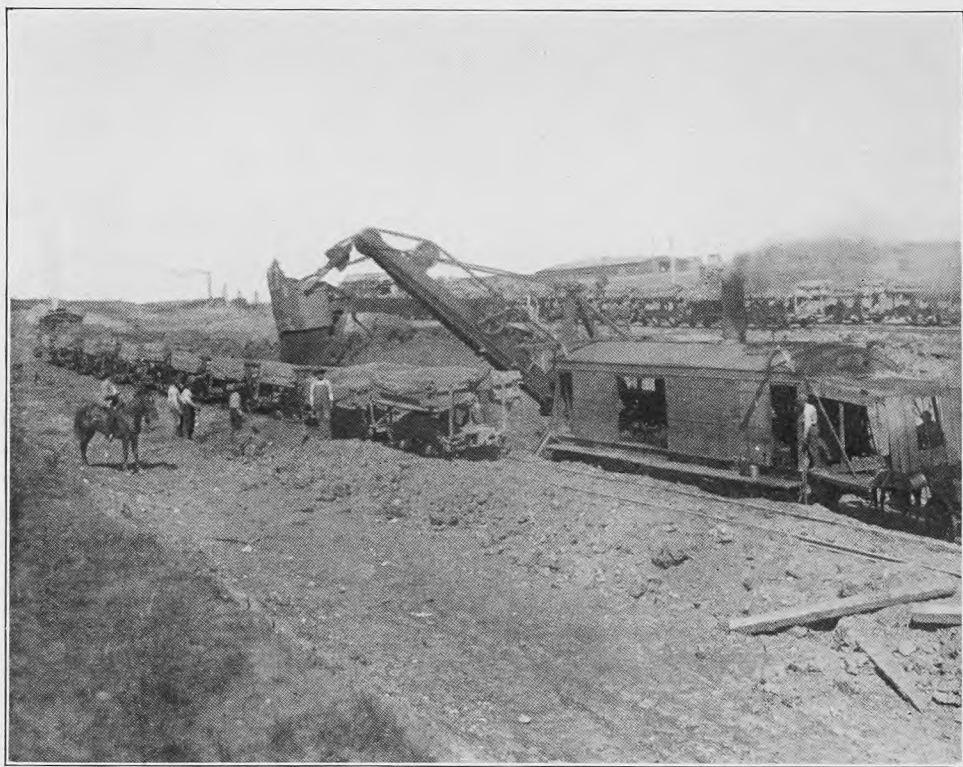
It parallels the river for a few miles to near the south-east corner of township 18, range 17, west Fourth Meridian, from which point it runs almost due east to a point three miles south-east of Brooks station, thence north-easterly to Tide lake in township 19, range 11. At the Horseshoe Bend the ridge is cut across by a wide valley, which apparently is an old river channel, the summit of which is only 95 feet above the river bed and about 600 feet from the same. A stream known as the Mat-zi-win creek has its source in the valley above referred to; and this is the natural boundary between the lands served by the two main branches of the system.

This project as outlined from the surveys takes advantage of a low pass in the watershed referred to, to take water from the Bow river by an intake located at the Horseshoe Bend. A dam is being built across the river at this point, which performs two functions. First, it will raise the water level at the intake, thus enabling the system to command a much larger area of land than it otherwise would have done; and secondly, it reduces the quantity of material to be removed from the main canal heading at the dam. At this point the ordinary low water level elevation is 2,515. The elevation of the canal headgates will be 2,549.6, and normal depth of water in the pool will be 11 feet higher, or 2,560.6. The dam is to



Excavation of main canal "B" (Eastern Section) looking towards the intake.

be a composite structure, consisting of a long and high earthen embankment on the west bank of the river, and a reinforced concrete spillway in the existing river channel, connected at its easterly end with the canal headgates. Just above the site of the dam the river makes a long bend in the shape of a horseshoe, which gives the locality its name, the dam being located at its toe. At this point the river is approximately 600 feet wide, its north or left bank having a narrow bench immediately at the water's edge and only a few feet above it, beyond which is a cut bank rising over one hundred feet above the bed of the stream. The west or right bank has a gravel beach rising gradually until it forms a tongue between the two legs of the horseshoe. This tongue has a broad flat top several hundred feet in width and rising gradually to the general prairie level, its general elevation near the river being about 25 feet above the bed of the stream.



Steam Shovel Excavation (Eastern Section Main Canal "B").

On this tongue an earth dam is now under construction, to which the spillway structure will be joined. This embankment will have a maximum height of about 45 feet, a total length of about 7,000 feet, and at its highest point is 310 feet in width at the base. Its wetted slope is 4 to 1, and dry slope 3 to 1, the top width being 32 feet, with a free board of 9 feet above normal water level. Provision has been made for under-drainage by a wooden box filled with boulders and gravel with suitable offtakes, and its upper slope will be paved with concrete slabs. It

will contain about one million cubic yards, which material is being transported from the excavation from the main canal across the river over a double track timber trestle. The foundations of this dam consist of a deposit of river silt overlying coarse gravel and boulders, which in turn overlie dense blue clay.

The spillway referred to is designed to pass over its crest 100,000 second feet without raising the surface of the pool above elevation 2563.6, or 14 feet over the crest, which required a free length of weir of about 600 feet. To allow for end contraction on account of the piers necessary to support the moveable crest, a clear length of 650 feet between piers was decided on.

As the crest of the dam and the sills of the canal headgates were fixed at elevation 2549.6, the additional depth of 11 feet for which the canal was designed, had to be maintained by some form of moveable crest for the entire length of the spillway in order to pass extreme floods. This moveable crest will be divided into 24 sections, and supported between piers giving 27 feet clear spans, and these openings will be regulated by structural steel gates, of the well-known "Stoney" type. In the determination of the spacing of the buttresses due consideration was given to the effect upon cost of construction, the time required to build the structure, and to the limitation in length of the gates corresponding to the spacing of the buttresses; with the result that these are to be at 15 feet centers, with every second buttress carried up in the form of a bridge pier. Emergency gates will also be provided in case of necessary repairs having to be made to the main gates.

The spillway proper is a reinforced concrete structure of the so-called "Ambursen" type, consisting of a heavy floor built upon the bed of the stream, and upon this floor are erected parallel buttresses of substantially triangular outline, having a slope on the upstream edge of about 45 degrees. Upon brackets or haunches projecting from the faces of the buttresses and parallel to the upstream edges, is built a concrete slab forming a deck, terminating at the top of the buttresses in a curved crest, and passing down over the down-stream edge of the buttresses in the form of an apron suitably curved to correspond as nearly as possible to the path of the overfall flood waters. In front of the dam the floor is being carried downstream a distance of about 75 feet, forming a tumbling hearth. In general, the cross section of the spillway is what is known as the Ogee section, and consists of constructing the downstream face of the dam between the crest and the floor in the form of a reverse curve; the lower edge of this curve being tangential to the floor of the structure, so that the overfalling nappe shall be let down the face of the dam and turned into a horizontal direction parallel to the river bed with the least possible disturbance.

The spillway is founded on a deposit of sand, gravel and boulders, overlying a thick stratum of stiff blue clay.

At the upper and downstream edges of the structure heavy cut-off walls are carried well down into the clay and bonded to the body of the dam. A concrete apron extends about 12 feet above the upper cut-off wall, and boulder concrete will be placed in the river bed for some distance below the tumbling hearth.

The structure is to be 720 feet in length between abutments, with a maximum height of 40 feet to the overflow crest, above which 11 feet of water will be retained by the gates above referred to. It will contain about 40,000 cubic yards of concrete, and $2\frac{1}{2}$ million pounds of reinforcing steel.

The abutments connecting the spillway with the earth dam are in the form of reinforced concrete retaining walls of the "counterfort" type, with a view of cutting off all possibility of leakage at this point. Provision has also been made for a road bridge on top of the structure.

The gates will be operated by a small power plant consisting of vertical turbines with direct connected generators installed inside the dam for this purpose, as well as for lighting and the operation of *other* headgates at the end of the main canal about five miles distant.

The canal headgates will form an integral part of the structure at its easterly end, and will consist of five openings each of 20 feet, controlled by "Stoney" sluices. These gates will control the discharge through a main canal of 90 feet bed width, carrying 11 feet of water, with 1 to 1 slopes, on a grade of .016 per cent. This canal is designed to discharge 3,800 cubic feet per second, and has a summit cut of 55 feet at about Station 10.

The contract for the spillway structure was let on October 1st, 1910, and work immediately started, it being anticipated that it will be completed within 18 months from that date.

The earthen embankment referred to is part of a very large contract awarded in June, 1910, which includes the handling of about 20 million cubic yards of excavation in this section of the Block.

At a point about five miles from the intake, an earth dam 1,280 feet in length, 35 feet maximum height, containing 80,000 cubic yards, was built across the valley, thus forming a tail pool into which the main canal will discharge. This dam has a top width of 12 feet, six feet above high water; has 2 to 1 slopes on the rear face and 3 to 1 on the wetted slope. Its face is paved with heavy rip-rap well bedded in gravel.

From this point two canals head—a north and east branch. The *north* branch with its distributaries will water about 90,000 acres, its dimensions being 29 feet bed width, carrying $6\frac{1}{2}$ feet of water, with 2 to 1 slopes, on a grade of .03 per cent. After crossing the railway line about one mile east of Bassano, its location follows the west flank of a deep valley known as Crawling valley. At a point about eight miles from its intake it drops 18 feet and crosses the valley by about 1,700 feet of flume, and runs northerly, gradually reducing in size until it reaches the Red Deer slope.

The *east* branch, like the north branch, heads out in the tail pool of the main canal, its size at the outlet being 68 feet bed width, carrying 9.3 feet of water, with 2 to 1 slopes, on a grade of .015 per cent. Near Lathom the first branch takes off, dropping 25 feet to cross the railway and water an area of about 107,000 acres between the Mat-zl-win and the One Tree creeks. This branch is known as the Spring Hill canal and is about 35 feet bed width, carrying 7 feet of water, with 2 to 1 slopes, on a grade of .025 per cent.

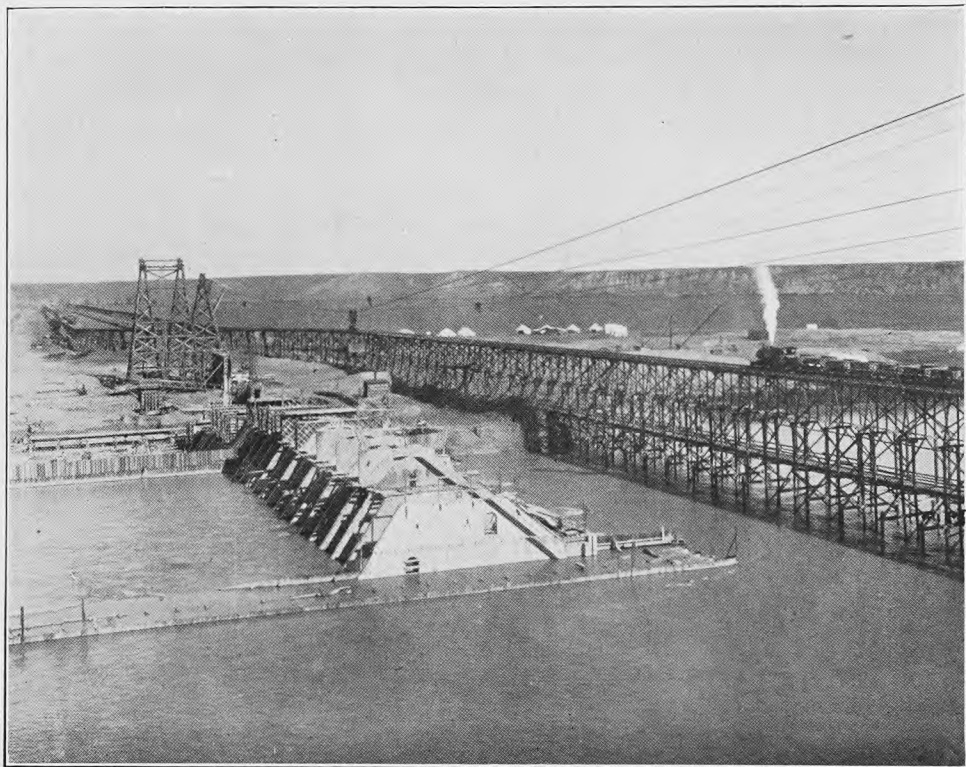
The east branch continues south-easterly along the northerly flank of the watershed as a 45.3' by 7.8' canal with a grade of .02 per cent, reaching the height of land at the head of Antelope creek, which is crossed by a flume 2,200 feet long with a maximum height of 22 feet. At this point it again forks, the south-easterly branch being known as the Bow Slope canal, which is about 17 feet bed width,

carrying 5 feet of water; and will serve all the land on the Bow river slope of the divide and lying west of the Rolling hills, amounting to about 42,000 acres.

At Cassils a smaller canal to cross the railway is taken off, to serve about 12,500 acres; and just south of Brooks the east branch discharges its waters with a drop of about 17 feet into Lake Newell reservoir, which will be formed in a depression in the Little Rolling hills, by the construction of a number of earth dams, the largest of which will be about 2,000 feet long and 30 feet in height. This reservoir will be about 9 miles long and $4\frac{1}{2}$ miles wide, and its storage capacity will be about 186,000 acre feet. It will be filled each season after the close of the irrigation period, and was the means of materially reducing the cost per acre of the project as a whole.

A tract of about 50,000 acres south of the reservoir will be served by a canal heading out at the south end. This will be known as the Rolling Hills canal, of about 19 feet bed width, carrying $5\frac{1}{2}$ feet of water, on a grade of .02 per cent.

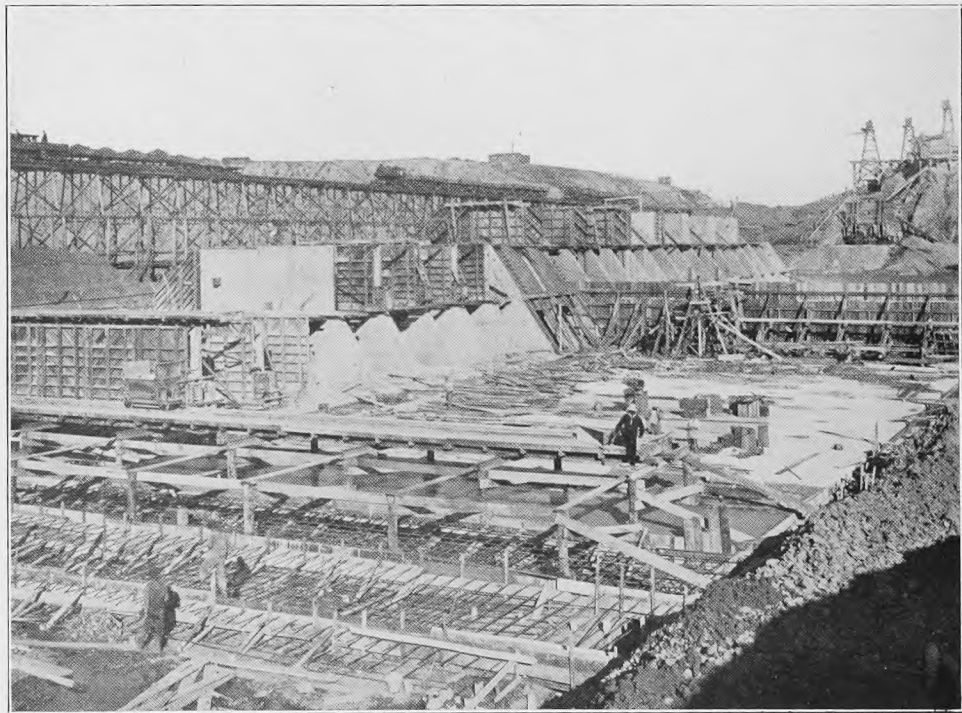
The outlet from the north end of the reservoir will serve about 118,000 acres known as the Bantry system, and its dimensions are 44 feet bed width, carrying 7.7 feet of water, on a grade of .01 per cent, and about five miles in length. At its easterly end it will discharge into a reinforced concrete flume 10,500 feet in length with a maximum height of 54 feet and a sectional area of 129 square feet.



Horse Shoe Bend Dam (Eastern Section) General view, looking west.

Considerations of storage values fixed the elevation of both ends of this structure, and under these conditions the type of crossing which gave the highest velocity for a given fixed friction head was imperative.

Numerous preliminary studies were made for the purpose of comparative estimates of cost, with the result that a somewhat unique design is likely to be adopted. The actual channel is of the suspended type commonly used in steel flumes. The exact section proposed is the elastic curve or hydrostatic catenary. For the purpose of a flume this curve has the advantage that it is the equilibrium polygon for a liquid filling it to the chord of the arc; the tension is everywhere the same; and there is neither moment nor shear at any point. When the struc-



Horse Shoe Bend Dam (Eastern Section) General view, looking east.

ture runs partially full, there are both moment and shear, and these are the factors which fixed the thickness of the shell. The substructure of the flume will vary with the head, and it is probable that a multi-arched design will be adopted, with spans varying from 30 to 100 feet. For the depressed portion under the railway line it is intended, as previously intimated, to use a reinforced concrete siphon; and in order to save excavation and provide means of measuring the discharge it is proposed to form a Venturi meter with a throat section of about 6 feet. The structure as a whole will probably contain about 25,000 cubic yards of concrete and upwards of 2 million pounds of reinforcing steel.

This flume will carry the water over a broad divide in the water-shed with its summit at a point about 3 miles south-east of Brooks, and will serve all the country east of that point.

At the easterly end of the flume the canal section is 44 feet bed width, carrying 7.7 feet of water, on a grade of .01 per cent, and in the north-east quarter of section 23, township 18, range 14, it splits, one branch of $37\frac{1}{2}$ feet bed width, carrying 7.2 feet of water, on a grade of .01 per cent, running north; and another branch of about 16 feet bed width, carrying 5 feet of water, on a grade of .01 per cent, running east and again crossing the railway line.

In section 14, township 19, range 13, the northerly branch again splits into two canals, each about 20 feet bed width, carrying $5\frac{1}{2}$ feet of water, on grades of .01 per cent, one branch serving the north and the other the south slope of the watershed.

The estimated mileage of canals and ditches to serve this section of the Block is as follows:—

	Miles.
Main canal.....	5
Secondary canals.....	475
Distributing ditches.....	2,020
Total.....	2,500

The structures, numbering thousands, will include drops, headgates, flumes, siphons and bridges, and to a large extent will be built of reinforced concrete and brick.

Details of construction cannot be gone into with the limited time available.

The different *cross sections* of canals and ditches are modified to suit conditions, such as discharge, available grade, nature of soil, and transverse slope of the country. On ditches $2\frac{1}{2}'$ by $1'$ to $3\frac{1}{2}'$ by $2'$, 1 to 1 slopes are used, and on ditches $4'$ by $2'$ to $4\frac{1}{2}'$ by $3'$, $1\frac{1}{2}$ to 1 slopes are standard, with banks 3 feet wide on top and one foot above water level. On small ditches no dependence is placed on banks as part of the canal prism unless the grade is one foot below the under side of the sod, or about $1\frac{1}{2}'$ cut on an average. On larger ditches on level ground the area of the water prism is generally about the cube of the depth; the banks being half the depth of water above water level, with a maximum of 3 feet; and a width equal to the depth of water on the upper side, and 12 feet on the lower side, where a roadway is required. Where the depth of water is over about 5 feet, 2 to 1 slopes are standard, although this is changed to $1\frac{1}{2}$ to 1 where extreme cross slope exists. Where the depth of water is less than 5 feet, $1\frac{1}{2}$ to 1 slopes are standard under ordinary conditions. Endeavors are made to balance cut and fill, with an allowance of about 15 per cent for shrinkage, unless it happens that shorter locations with heavy cutting through a ridge would result in a reduction in quantities.

The *grades* are so selected as to give a uniform velocity of about $2\frac{1}{2}$ feet per second, and not to exceed 3 feet per second; consideration being given to the character of the soil, and the depth of water in the ditch.

Where the slope of the country is so great that the velocity would be too high if the canal were given a bed slope to correspond therewith, the *excess* fall is concentrated by vertical drops; and where such drops occur too close to one another for safety or economy, a short section of flume or lined channel is employed for the purpose of overcoming the excessive grade.

Losses by seepage and evaporation are allowed for as follows:—

In preliminary projection:

	Per mile.
Canals 2 to 100 sec. feet,	1%
“ 100 to 500 “5%
“ 500 to 1000 “25%
“ 1000 and over “10%



Horse Shoe Bend Dam (Eastern Section) Construction of earthen portion.

For final projection and design the following formula is used:—

$$P = C W d$$

where P = loss in second feet per mile of canal.

W = the width at full supply level.

d = the depth of water.

C = a constant = .020 for sand

.0185 for gravel and sandy soil.

.0170 for average earth.

.0150 for clay.

.0140 for dense hard clay.

Alignment. Curvature is carefully considered and on the larger canals curves are regularly run in with transit and chain, the radius allowed on the larger secondary and branch canals being between 15 and 30 times the depth of water. On smaller distributing ditches a radius 6 to 8 times the depth of water, with a minimum of about 10 feet, is aimed at. As far as possible the land lines are adhered to in laying out the distribution system.



Horse Shoe Bend Dam (Eastern Section) Showing head towers and mixing plant.

Tail channels. At each point where water is divided by a branch gate, an alternative path is provided to carry off tail water to some drainage channel, the capacity of these tail channels bearing a constant proportionate relation to that of the various irrigation ditches above them. In no case is this less than 2 second feet, and otherwise is 25 per cent of the capacity of the canal or ditch just above. These tails are located on the land lines as far as possible; otherwise they are made to reach the drainage channels by the shortest possible route.

Cross drainage is provided for in three ways: (1) it is taken under the canal; (2) if small in extent of catchment area, it is taken into the canal system by an inlet; (3) it is carried over the canal. The type of crossing adopted depends to a large extent on the importance of the drainage line; on the character of its channel; and to some extent on the size of the canal. No definite rules can be laid down

to meet all cases, but as a rule the cross drainage is handled in the order above referred to, with due consideration of cost. The material chiefly used in connection with the smaller under crossings has been corrugated metal culverts, up to 36 inches in diameter, manufactured from both Ingot iron and Toncan metal. For larger structures reinforced concrete pipe and arch culverts will be used.

Flooded areas are avoided by the use of double fills or levees, combined with means of taking care of the cross drainage as above referred to.

Spillway or escape channels, with the necessary structures on the canal system, are provided at frequent intervals, averaging about 6 miles where possible, on all secondary and branch canals, their capacity being at least 10 per cent and not exceeding 25 per cent of the canal in which they head.

Overhaul is calculated by the well-known methods of Mass Curve, the limit of free haul being 100 feet parallel to the canal axis. In case of borrow pits not on the ordinary cross section, the length of haul is measured in a straight line between the centers of gravity of cut and fill.

Excavations. Necessary waste is used to widen the banks uniformly, and to strengthen the higher fills. Borrowing where necessary is done by (1) deepening the canal; (2) widening it; and (3) both if required. If neither is practicable, borrow pits are made well away from the canal on the high side and so arranged as to drain into the canal. Where side borrow is absolutely necessary, a berm equal to at least the height of the bank is left between the toe of the bank and the edge of the borrow pit.

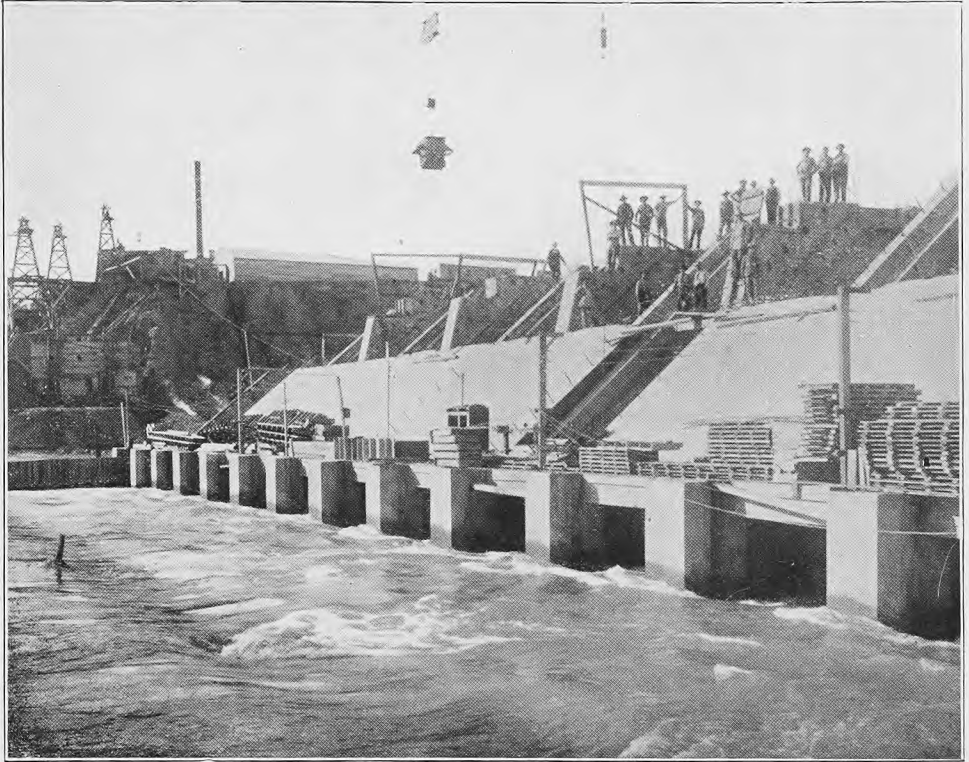
Embankments are in all cases put up with material from adjacent cuttings or from borrow pits if the former is unsuitable or deficient in quantity. In determining the outer slope, the plane of saturation is considered as sloping from high water level at the rate of $3\frac{1}{2}$ to 1, and this plane is not allowed to intersect the outer slope or to approach the toe nearer than 10 per cent of the base width. In very high fills where the above requirements lead to excessive material, the slope of saturation is increased by draining the rear or outer half of the embankment, or by constructing the first three feet of the outer third of the bank with sand, gravel or other porous material.

Stripping and Bonding. The under surface of the embankments is *bonded* when the head against the banks is 2 feet or more, and less than half the top width, providing two furrows and one additional furrow for each extra two feet, with one furrow just inside the upper or wet toe, one under the center, and the balance, if any, between them. The surface is *stripped* when the depth against the bank exceeds half its top width; when the cross slope exceeds 1 in 6; in boggy ground; or when the soil exceeds plow depth. The surface is *bonded and stripped* when the head against the bank exceeds 10 feet; when the surface is hard and dry after stripping; or when the cross slope exceeds 1 in 4. The width of stripping is determined by the plane of saturation above referred to.

Rotation of supply. This portion of the system is being designed with a view of rotation in supply being adopted, which will result in each individual farmer obtaining a satisfactory head; a fair division of water; and simplification of operating problems. This is a matter which cannot be worked out in detail until the lands are settled, but the system is being designed on the basis of giving parcels

of between 80 and 160 acres a supply of 2 second feet for a period of 96 hours, and parcels smaller than 80 acres a similar flow for 48 hours.

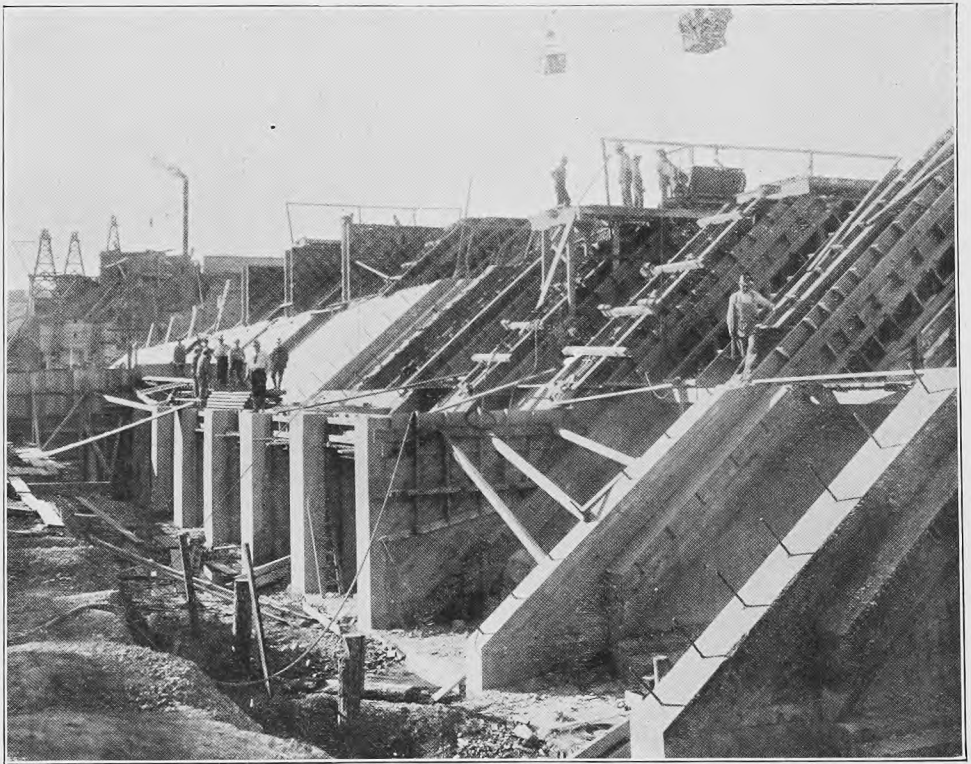
It is the *intention* that daily records of the receipt and delivery of water and of the outflow through all branches of the system shall be maintained from the beginning; such data being as necessary in irrigation management as is bookkeeping in any commercial institution. The information thus obtained is essential in enforcing proper water economy; in preventing land from being injured; and in keeping farmers from getting into bad habits in using water, which if once acquired, result in reduced crop production, increased cost of operation, and needless annoyance to the management.



Horse Shoe Bend Dam (Eastern Section) Upstream face of concrete spillway.

World-wide experience in the use of water on cultivated lands under any kind of crops during long periods of years, shews that the duty varies with, (1) the nature of the soil; (2) the age of the soil; (3) the kind of crop; (4) the weather conditions; (5) the slope and condition of the conveying channels of supply; (6) the distance the water is carried in the ditches and channels to the fields; and (7) the experience and skill employed in irrigation. As you are aware, the *legal* duty in the province of Alberta is fixed by the Irrigation Act as a continuous flow of one cubic foot per second per 150 acres for 153 days between May 1st and September 30th. Measurement of this supply is arranged for by weirs approved of by the Commissioner of Irrigation.

The company has adopted the plan of constructing the complete distribution system so as to deliver water at the boundary of each farm unit of 160 acres or less; as it was considered impracticable to leave to the settlers the building of the smaller ditches, which would have resulted in delays to the work, excessive cost and a retarding of the development of the area, followed by increased difficulties in operation. In constructing the distribution system, 160 acres has been considered the farm unit, although in the western section several colonies have been established on the so-called "ready-made" farms of 80 acres. In the eastern section of the Block about 5 per cent of the farm units will be sold as 80 acre farms, in addition to the establishment of a number of colonies on farms averaging from 80 to 120 acres.



Horse Shoe Bend Dam (Eastern Section) Upper face of concrete structure.

The successful *outcome* of any large irrigation project is only *partially* solved by good construction; and in some cases the administrative heads of large schemes have failed to realize that the *ultimate* success of such enterprises cannot be fully brought about without farmers; and that it is their labors which determine the real value of such properties. With this realization, the sale of the lands in this Block warranted the establishment of a very large organization which has extended over all important points in Canada, the United States, Great Britain and parts of Continental Europe; and which has resulted during the past five years in the disposal of over 1,300,000 acres.

Everything that follows in the wake of increased population is an argument in favor of irrigation and the cultivation of small areas; which can only be carried out by this means of farming. Moreover, this results in a better type of farmer, greatly improved living conditions, and correspondingly elevated social conditions.

No practical agriculturist can fail to realize the fact that the scope for irrigation in semi-arid conditions in northern latitudes is very great; and that this system of farming will ultimately become a leading factor, and occupy a vitally important place in the agricultural development of Southern Alberta.

THURSDAY SESSION.

Excursion to Bassano to inspect C. P. Ry's huge Irrigation Dam at Horse-shoe Bend. Lunch provided by Board of Trade and City Council.

Stop made at Strathmore upon return journey, to visit the Demonstration farm and participate in strawberry feed.

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JUN 19 1981

HD 1741 C2 W52 5TH 1911
WESTERN CANADA IRRIGATION
ASSOCIATION

REPORT OF THE PROCEEDINGS OF
SERIAL M1 40824172 SCI



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HD 1741 C2W52 5th 1911
Western Canada Irrigation
Association.

Report of the proceedings of
SCI

ONE WEEK LOAN

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